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Agriculture

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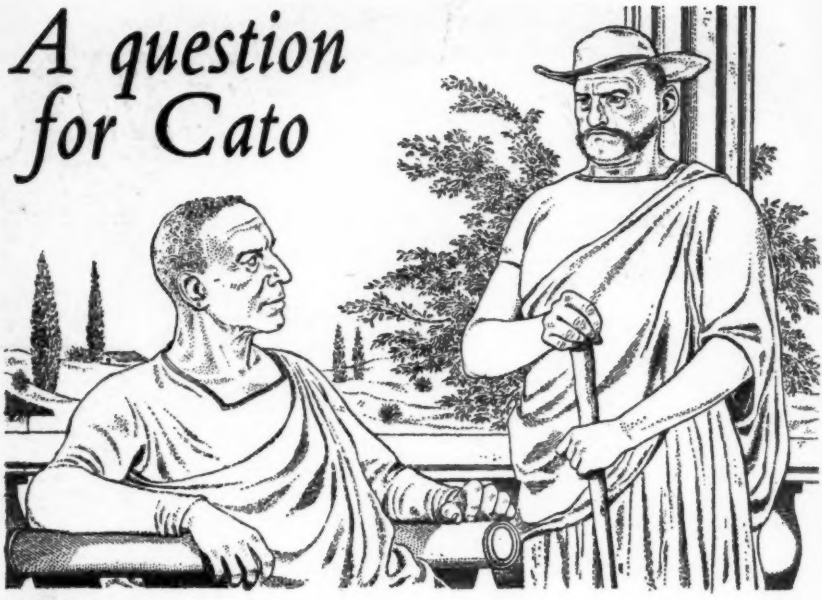


The District Office

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NINEPENCE MONTHLY

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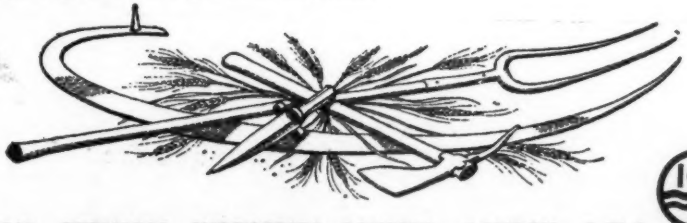


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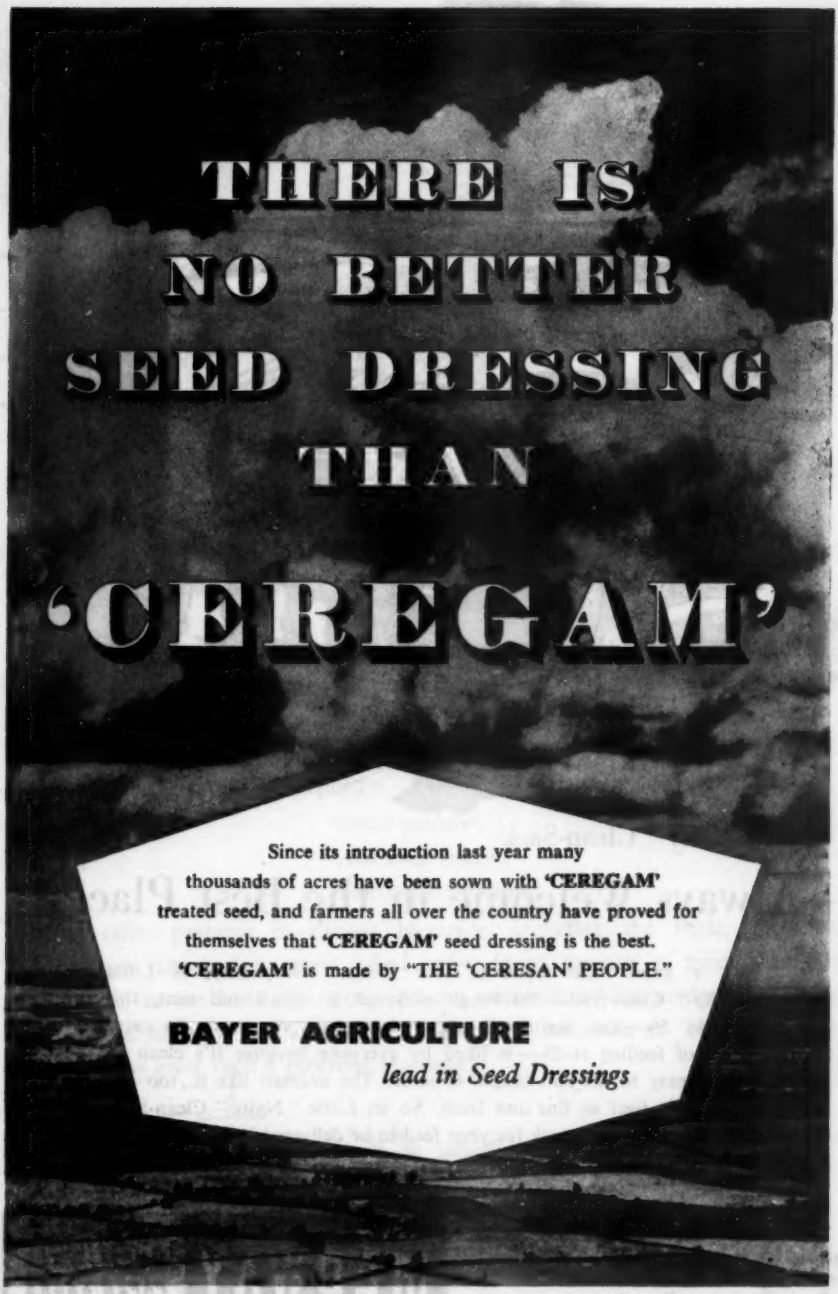
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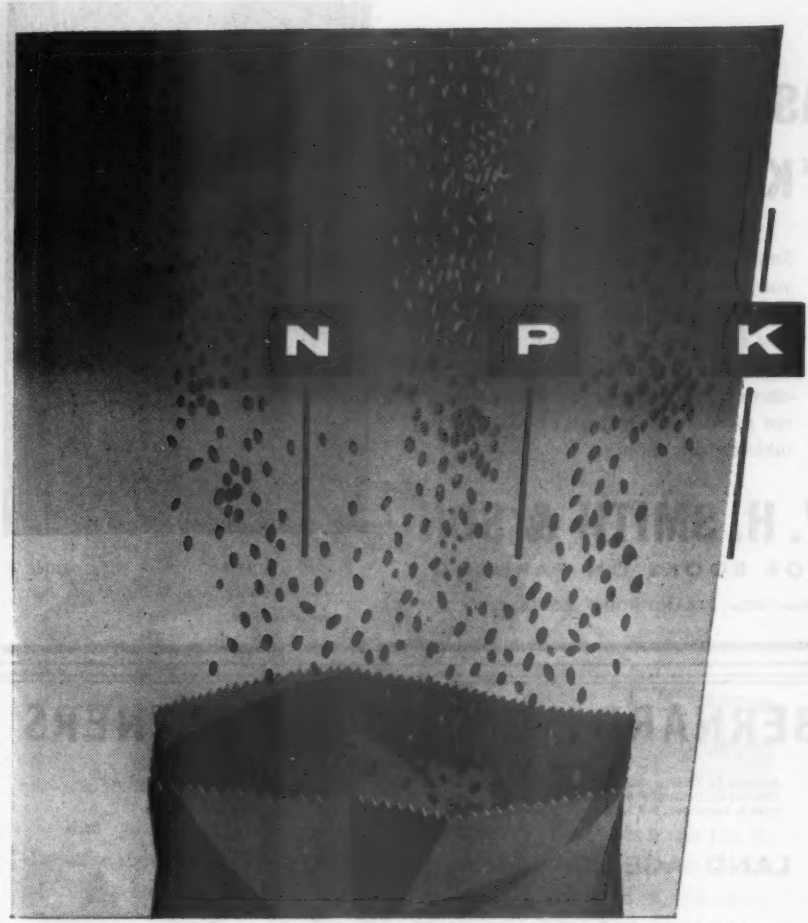
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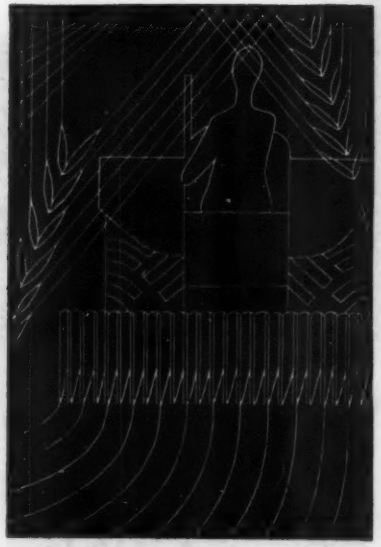


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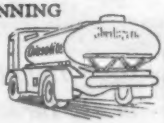


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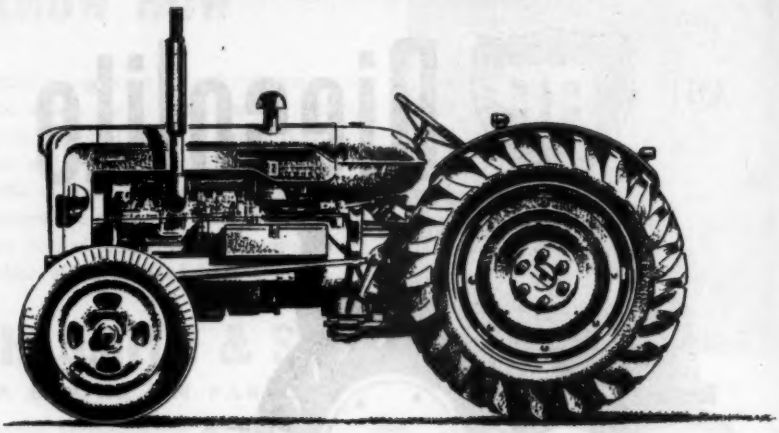


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AGRICULTURE

VOL. LXII No. 7 OCTOBER 1955

THE STORY OF F.A.O.

SIR DONALD VANDEPEER, K.C.B., K.B.E.

Quietly, but effectively, the work of F.A.O. has been going on now for ten years. Sir Donald Vandepeer focuses attention on the nature of the Organisation and the contribution to its understanding which Mr. Gove Hambidge's recent book has made.

THERE are far too many people in this country who, when the initials F.A.O. are mentioned, or even when they are spelled out to "The Food and Agriculture Organisation of the United Nations", raise inquiring eyebrows. "Do tell me", they say, "what is it and what does it do?" The difficulty about F.A.O. is that it is not sensational; it makes no headlines; it barely makes what the press (and presumably their readers) consider to be "news". There are no vetoes, no crises, no inflammatory speeches at its Conferences and Council meetings. Its work does not produce results with dramatic and exciting suddenness.

And yet F.A.O. is concerned with, and is tackling with patient devotion, the most fundamental of all human problems—the feeding and clothing of the world's steadily growing population. Those of us who are fortunate enough to live in the highly developed countries, and unfortunate enough not to have travelled extensively in the Far East, the Middle East and Africa, are so accustomed to take our high standard of living for granted that it requires a stern effort of the imagination to picture the conditions in which hundreds of millions of the world's inhabitants are still living. It was the vivid realization of this problem, and of the need for making a concerted international effort to grapple with it, that led President Roosevelt to call the nations together in May 1943, right in the middle of World War II.

Delegates of forty-five nations attended the Hot Springs Conference; an Interim Commission on Food and Agriculture was set up to produce a blueprint of a permanent international organization; and in October 1945, at Quebec, F.A.O. was born.

In November 1955, in its permanent headquarters at Rome, F.A.O.—now with a membership of seventy-one nations—celebrates its tenth anniversary. It is an appropriate time for review and appraisal, and the publication of *The Story of F.A.O.* by Gove Hambidge* is most welcome and opportune.

World Welfare To describe in a single volume the purpose, the origin, the development and the manifold activities of an international organization with the world as its province was a formidable task. Mr. Hambidge has done it well. Inevitably, with the mass of material which had to be condensed into some 240 pages, it is difficult at times to see the

* Van Nostrand, New York, and Macmillan, London, 48*s*.

wood for the trees, especially in the section dealing with technical work on regional and country projects in the Near East and Africa, in the Far East, Latin America and Europe. Nevertheless, all who are interested to learn something of what the nations of the world can do for world welfare when they work together in harmony and with a common objective will find *The Story of F.A.O.* a fascinating and stimulating book.

Mr. Hambidge begins with a dramatic example of the problem which F.A.O. was created to tackle—the contrast between the conditions of life and the productive capacity of two typical tillers of the soil, one in Egypt and the other in the United States.

Abu Libda is one of the millions of Egyptian peasants; his methods of growing food are virtually those which have been practised by his forefathers and their forefathers before them since the days of the Pharaohs. In his village "The poverty and squalor, the dust, dirt, sores, flies seem to a Westerner almost unbearable. But the fellaheen live so day after day and year after year and generation after generation. They do not know anything better. They do not live long."

Jim Barton farms 160 acres in Iowa. In his boyhood, by the unremitting hard work of the whole family, the farm produced practically all their food and a cash income sufficient to enable them to live in reasonable comfort. But mechanization and the application of the inventions and discoveries of modern science have revolutionized Jim Barton's methods of production, greatly increased the productive capacity of his farm, reduced his hours of work and notably raised the standard of living of the whole family.

That, says Mr. Hambidge, is the problem; there is the gap. It is the task of F.A.O. to narrow it.

Planning from Rome How does F.A.O. set about it? The headquarters of the Organisation are in Rome, housed in a modern building provided by the Italian Government. Here the Conference of the seventy-one member nations meets every other year to decide on matters of policy, programmes and finance. The Council, a sort of general purposes committee, comprising twenty-four nations, and other committees, meet here at more frequent intervals to exercise a closer supervision over the work of the Organisation than it is possible for the Conference to do.

Here also are the Director-General and his headquarters staff, a total of some 1,000—a figure which many will consider moderate for an international organization concerned with problems of agriculture, fisheries and forestry over the greater part of the world,* especially when compared with corresponding national figures for the food and agricultural departments of many western and North American countries.

This is the nerve-centre, planning and directing the field operations approved in principle by the member-nations in Conference, surveying and appraising year by year the trends of world food production in relation to world population—telling Governments and nations whether the Malthusian devil is gaining or losing ground. The "hands" of the Organisation, carrying out the work in the field, are technical experts, recruited from all over the world for the special work of their particular "assignment": a machinery expert from Denmark advising on the use and maintenance of modern farm machinery in India; Chilean and United Kingdom veterinary officers devising a plan for the development of the whole livestock industry of Afghanistan;

* The "Iron Curtain" countries and China are not at present members.

a Chinese expert on inland fisheries helping Thailand to grow edible fish in flooded rice fields, canals and swamps; German and French specialists advising the Government of Guatemala on a broad programme of forest development and forestry training.

These few random examples of the field work of the F.A.O. technical staff indicate both the nature and the variety of the tasks performed by F.A.O., and give some idea of the many more which await attention when time, staff and the all-important money are available. Those projects specifically mentioned by Mr. Hambidge must run into hundreds. There are at present some 300 F.A.O. experts working in the field—and " in the field " means for F.A.O. the deserts of North Africa and the Middle East, the bush and jungle of Central Africa and the Far East, the sun-baked plains of India and the mountains of Central and South America—wherever the soil and the waters of the Earth can be made to produce more food, shelter and clothing for man. It is arduous work for these men, demanding resolution, devotion to duty and, in many cases, physical endurance in which grave risks to health, even life, are involved.

Precept into Practice It is F.A.O.'s primary function to advise Governments and their own technical officers (who may themselves have to be trained) on modern methods, to provide the knowledge, to suggest ways and means of organizing improved production. All the technical assignments are therefore for specific and limited projects, and it is clearly understood that, once the knowledge has been imparted, the advice given and the course indicated, it rests with the Government concerned to take such steps as may be appropriate and possible in their own particular country to see that the individual producer is encouraged and helped to put precept into practice.

The " Regional " project is one in which F.A.O. can perform exceptionally valuable service. Plant and animal pests and diseases pay no respect to national boundaries, urgently needed schemes for water supply and irrigation are often impossible without friendly agreement and co-operation between neighbouring Governments. F.A.O. can and does help in bringing Government representatives together round the conference table to discuss a common problem, and in suggesting means of dealing with it. An outstanding example of co-ordinated work of this sort under the auspices of F.A.O. is the campaign against the desert locust, in which all the countries of the Middle East and North Africa are allies. Mr. Hambidge, referring to this campaign, says that although desert locust control cannot yet be said to be fully effective, " the outlook for freeing millions from its antique tyranny is brighter today than at any time since the Pharaohs ".

At this stage in a short article one feels strong sympathy with Mr. Hambidge in the difficulties he had to face in condensing his material between the covers of a reasonably sized book. There is so much to tell; so little space to tell it in. The ways and means of financing the Organisation, its economic work, its relations and joint activities with other international organizations and agencies, such as the World Health Organisation and the United Nations Children's Fund, the personal influence of the great Directors-General—John Boyd Orr (now Lord Boyd Orr), Norris Dodd, and now Vincent Cardon—on the character and development of F.A.O.; these and many other subjects demand attention in a comprehensive review of the history and work of one of the most successful and beneficial of international organizations. They are adequately dealt with in *The Story of F.A.O.*

THE NATIONAL AGRICULTURAL ADVISORY SERVICE

CLYDE HIGGS
Stratford-on-Avon

Mr. Clyde Higgs, one of the most prominent figures in the farming world, offers his personal comments and criticisms of the N.A.A.S. on the occasion of the Service's eight-year report.

MY memory of technical advice for farmers goes back a longish time. In the mists I can just define the first meeting I attended as a very small boy. It was held in the lamp-lit village hall, and the lecturer who discoursed on the benefits of concentrated feeding for cattle was provided by the courtesy of cattle food manufacturers. At the end of the meeting he was pleased to accept orders for early delivery! Those were far-away days—reapers to harvest the corn, and gangs of Irishmen who came regularly to the same farm year after year to tie the grain with straw bands and stook it. Lots of leathery-smelling horses and no tractors. Milk production was of a pretty low grade; in hot summer weather it was something of an achievement not to get half the churns returned sour after their fifteen-mile journey by rail to the neighbouring town. Seven-day weeks, with holidays (as far as daily chores allowed) on Christmas Day and Good Friday. The veterinary surgeon lived six miles away without a telephone. If he was wanted he had to be fetched, or better still the animals could be ill on Tuesday, his visiting day.

I am grateful to the County Agricultural Organizer who, when I started farming, freely gave me advice, some of which was accepted, but all of it gave me food for thought. He even coached me in the evenings, although, physically tired by the work of the day, I fear I often took short naps during his dissertations.

In the last war I had closer contact with technical advice as chairman of a County Technical Development Committee. It was pretty haphazard, for few competent technical officers were available and the County Council by no means approved of the new organization.

The question was: could the industry itself, at its own expense, provide technical advice? We farmers owe a debt of gratitude to the pioneers who, nine years ago, had the foresight and courage to launch the National Agricultural Advisory Service. In view of the increasing importance and complexity of British agriculture and the political interest in it, which appears to be permanent, there seems to be little doubt that a farming advice service, managed and financed by the Government, is the right thing.

This article is written without full knowledge of the political implications, or of the slowly grinding mills of the Civil Service involved in the setting up of such an organization. The comments are those of a farmer who has faith in the present and future of our industry and feels that the prospects become brighter every time we can produce more for less. Any criticism of the N.A.A.S. (and there is bound to be criticism of a nine-year-old) is in the kindliest spirit, for I realize that in the beginning many bricks had to be made without straw—no buildings, no equipment, very limited personnel, many of whom were dubious about their prospects on joining the new venture.

Let me make two major criticisms. I have before me the report of a farm walk attended by a District Officer—most of it interesting stuff which should

be useful to any farmer—but it is marked in large letters, "Confidential". Why? Then there seems to be unnecessary mystery surrounding the financial aspects of experiments. One of the husbandry farms that I have visited seemed all that it should be; buildings, equipment, organization, crops, and everything else were above standard, but no figures were available. It seems that the N.A.A.S. shows how things can be done—and shows it well—but leaves the ordinary farmer to find out for himself whether they are profitable and likely to fit in with his own system. Surely a lot of time would be saved and a service conferred if costs were made known.

The recent report on the National Agricultural Advisory Service* covers its progress for the first eight years without once mentioning costs. It might well have included a note that when the Service is fully established (the number engaged is less than that originally contemplated because of the Government's decision to limit manpower in the Civil Service) the cost of the whole outfit to the country will be less than one penny in every pound of farm turnover. Nor does the report include addresses of the many officers and offices which it mentions. It does point out that the Advisory Aids Officer is not the Publicity Officer. He jolly well should be, for the N.A.A.S. is too modest and unaggressive. I think that the Service could well do with an injection of enthusiasm and crusading spirit. The report says that 375,000 advisory visits were made last year. I wonder what proportion of them were at farmers' requests and what through officers' initiative?

I know and fully appreciate the willingness of the N.A.A.S. officers to give any information in their power—when it is asked for. They come and take routine soil samples for me so that the farm is covered every three years; they sympathize and suggest when I have trace mineral deficiency problems; they help me out and invigorate my milkers when a bad milking sample comes along, as it does on the best-regulated farms; we discuss silage, grass seed mixtures and grain varieties; the Livestock Officer talks about the future of milk and meat when he comes at my request to license, or refuse to license, a bull calf. They will attempt to solve any of the many problems which beset modern farming, for in my short experience it has become incredibly involved.

The farmer of today, whether he has just a few acres or thousands, can best do his job by being an organizer and administrator, and relying for technical advice on the many experts now available.

In my opinion, farm science generally is far in front of practice. The cream of farmers take full advantage of new ideas and methods; if the middle class did the same (ignore the small percentage of bad ones), there would be an astonishing rise in production. Impressive lists of farm walks throughout the country reach me regularly. No doubt, they are attended mainly by keen farmers. It is the job of the N.A.A.S. and its District Officers, the contact men, to attack and elevate the middle class.

To keep these officials keen and to build up tradition of service, there must be flexibility within the N.A.A.S. The young District Officer should feel that he carries a Director's pen in his pocket. His promotion can come only by movement. It is not easy to build up goodwill among some 800 farmers (the share of most District Officers), but having done so, farmers are reluctant to let their advisers go. Yet in everyone's interests it is better that moves should be fairly frequent to prevent any possibility of staleness.

---

* *Report on the National Agricultural Advisory Service: The First Eight Years, 1946-54.* From H.M. Stationery Office, or through any bookseller, price 3*s.* 6*d.* (3*s.* 8*d.* by post.)

Now, I am going on to delicate ground and with real tact shall leave two questions unanswered. Should County Agricultural Committees continue to have any influence on the N.A.A.S.? "Influence" is right rather than "control", because the County Agricultural Officer, while having divided allegiance, must lean towards his provincial headquarters. As things are, County Agricultural Committees will continue to carry out various duties—some of them of a statutory nature—but would it not be better if technical advice were separated entirely from legal matters? It is said that District Committees are best able to help local farmers through District Officers, but let us be open and admit that District Committees are getting less active every day. Contact between farmers and the Advisory Service could be maintained by representatives on the Provincial Committees.

Secondly, is it sensible for agricultural education to run parallel to technical advice? There is liaison between them, yet it would be simpler if they were unified and so provided more steps on the ladder of promotion. It might be that an Advisory Service would be better without some of the routine jobs connected with milk, calves, bulls, boars and seeds, although such separation would result in a need for extra staff and possibly another organization.

At the half-dozen shows which I have attended this year, the N.A.A.S. has put up some first-class exhibits in keeping with the occasions and the districts. Each has shown skill in telling its story clearly and I was impressed by the willingness of officers either to answer my questions or to find others who could. Time is too short for such exhibits to be profound; the theme must be obvious and the illustrations very clear if the seething crowd is to gain any benefit. All the exhibits fulfilled those requirements, and one on a permanent ground had the advantage of established plots which carry on from year to year and are visited at other than show times by many students.

In spite of the fact that I could not get costs figures, the layout of experimental farms impressed me. Obviously, capital expenditure is far in excess of that which would be incurred on most commercial farms. Perhaps it could be justified. Possibly an influx of money into the land might produce a worthwhile return, but with so many counter and more profitable industrial attractions that is not likely to happen.

Ten of the eighteen experimental husbandry farms are working on soils varying from blowaway sand to intractable clay. The late Grassland Station at Stratford-on-Avon is to be another, and I hope that there, emphasis will be on beef production, how to do it, and what it costs, for there is very little information available.

There is greater interest in farm management—the art of welding together the wide and proven technical knowledge with the economic principles that govern efficiency. It is of no use adopting new ideas and methods unless they fit in with the farm and increase profit. Technical efficiency may be wasted if farm organization or management is wrong.

More emphasis is being placed on the economic side of the industry. As the report says, "It is essential to increase the pace, especially in raising the quality of home-produced foods, in catering for consumer choice, and reducing unit costs of production". That, in a nutshell, is the whole purpose of the N.A.A.S. The first eight years have laid a foundation. Many units both human and material are finding their level. The £2½m. annual charge may prove a good investment by reducing the £250m. which the country is finding annually in subsidies. The N.A.A.S. has done well in its first eight years. May its furrow be as straight and well defined in the next eight.

CROPS NOT RABBITS

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Five Wiltshire farms provide an outstanding example of what the absence of rabbits can mean in terms of better crops and increased stocking. But we must grasp the opportunity myxomatosis has provided and exterminate the survivors, for the rabbit will surely return if we let it.

MYXOMATOSIS gives us a unique opportunity to make a permanent end, if we choose, to the colossal annual losses caused by rabbits. On the other hand, if we ignore the chance it could soon be just past history, a mere lull in the raids that have sapped farming production for years. Wiltshire farmers have already decided against the rabbit. In a series of twenty-one meetings throughout the county, held from April to June this year in co-operation with the National Farmers' Union and the Country Landowners' Association, the Wiltshire A.E.C. have presented such telling pictorial evidence of the 100 per cent better crops obtained in previously infested areas that the farming audiences have given full support to a voluntary scheme to keep rabbits out without waiting for the application of the 1954 Pests Act.

A sprawling 80 acres of derelict woodland, felled many years ago and now a maze of thickets, amply illustrates the wisdom of this choice. Before myxomatosis it swarmed with rabbits. Areas such as this are particularly difficult to control, and all the efforts of the owners and the Committee's officers did no more than stem the tide. In hard cash their keep has cost the men farming the 200 or so acres immediately adjoining the wood at least £2,000 a year, and, of course, the rabbits travelled much further afield than that. However, myxomatosis took its toll last winter, and this spring and summer there was not a rabbit to be seen.

The Land is Farmed Again Five farms border the wood, and the crops this year are a picture. Corn is growing right up under the boundary trees where previously there were only closely grazed lawns. Farm No. 1 totals 80 acres, of which 20 adjoin the wood. A 9-acre ley, directly seeded in 1953, was just a mass of thistles last year with the grass gnawed down to the roots. There was nothing for cattle, but some parts must have carried at least 40 rabbits to the acre. Top dressed with complete fertilizer this spring, the ley has recovered remarkably well and 2 tons of hay per acre have been taken off it.

An adjoining 11-acre pasture had carried no cattle since 1953, but ploughed this February it has grown 12 sacks per acre of Atle wheat. The farmer reckons he will be able to build up his milking herd by an extra ten cows—if the rabbits stay away.

Farm No. 2 totals 317 acres; 120 arable and the rest in grass, with a 50-cow dairy. Some 43 acres actually touch the wood, although the whole farm has always suffered from far too many rabbits. Last year 35 acres of Hybrid 46 winter wheat averaged only 3 sacks an acre, entirely due to rabbit damage, and the farmer estimates that in the two years 1953-54 rabbits cost him

£4,000 in crop losses. He is now planning to increase his total cattle numbers from 90 to 130.

Farm No. 3 totals 240 acres, of which 40 abut upon the woods. Last year 25½ acres of pasture yielded 25 tons of hay. This year the farmer cut over 50 tons off exactly the same area. It was the same in a 15-acre field of barley; last year only half a crop, this year a crop to make the combine grunt.

Farm No. 4 totals 100 acres, and although only 3 acres actually fringe the wood, the whole farm has always suffered from its proximity. The 3-acre field mentioned had never produced a crop at all, but after ploughing last winter it has grown a very useful crop of spring barley. This farm also carries a dairy herd, and the farmer has decided to buy in an extra ten cows this autumn.

Farm No. 5 totals 150 acres, with 50 bordering the wood. From one 16-acre field, which was in spring barley last year, the farmer harvested 4 tons of grain. This time he reckons to get more than double that off half the field, which is in barley again, and has also stacked 16 tons of hay off the other half.

Another 12 acres of winter wheat undersown to grass gave only half a crop in 1954, but this year the new seeds produced 2½ tons of hay per acre. A 4-acre pasture, which cut only ½ ton of hay last year has carried 7 heifers easily this spring and summer. The farmer plans to rear an additional 20 heifer calves this autumn and to build up his stock numbers that way. Other fields have given equally remarkable increases over the low returns which were once the accepted order of things. Of course, all these farmers have used some fertilizer on their grass this time where previously it would have been like tipping it down the drain. In short, the land is being farmed again.

Complacency is Dangerous While such spectacular changes are not exactly typical, it is only a difference in degree. Here we had 80 acres of woodland harbouring a rabbit population that was grazing adjacent farmland very heavily. Such a population would, in the general way, be spread over perhaps twenty times that area. There lies the danger; the rabbit was an insidious problem, there all the time but not apparently bad enough to rouse us to drastic action.

To try and nail the real extent of rabbit losses on the ordinary farm, the Ministry of Agriculture carried out a trial in 1952 on fields of winter wheat selected at random all over the country, comparing the yields from fenced and unfenced plots. The average loss turned out to be just over 1½ cwt. of grain per acre—certainly not to be disregarded on something like two million acres of winter-sown corn annually, not to mention the spring cereals, grassland and other crops.

In England and Wales, the Minister's powers under the Pests Act, 1954 to make Orders designating rabbit clearance areas has been delegated to County Agricultural Executive Committees. A Rabbit Clearance Order is designed to help farmers and others in their efforts to protect their crops from the enormous damage that can be done by wild rabbits, and effective action can be taken by Committees against those who fail to help themselves.

But no legislation like this can hope to succeed without the active co-operation of the majority of the farmers whom it is designed to protect. The County Pests Officers are anxious to give every possible assistance, and occupiers are urged to report the first sign of any rabbits to them. They will be glad to advise, and, if required, will undertake blocking of holes and gassing.

Already, many farmers chatting among themselves will mention the odd rabbit they have seen recently, and there is no doubt that rabbits are gradually reappearing—not in any great numbers as yet, but just a few here and there. Yet unless these few are eliminated as soon as they appear, they will rapidly build up in numbers again.

Woods like the one described above are real danger spots. But rabbits can also travel fast and far, and it is up to everyone to guard his own acres. Complacency is the one thing that could beat us.

BRUSSELS SPROUTS FOR MARKET

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A recent survey of the main Brussels sprouts-growing areas reveals great variation in varieties, type, and methods of grading, cleaning and packing the produce for market.

BRUSSELS sprouts form one of the most important brassica crops in Great Britain. They are widely grown throughout the country, with certain areas tending to specialize and thus become noted for their production. For example, "Evesham" and "Bedford" sprouts are common terms in the wholesale trade, frequently signifying recognizable differences resulting from the type and methods of preparation for market used in those districts. The production areas which are embraced by these terms—comprising mainly the Vale of Evesham and the County of Bedford—were therefore chosen for a survey of the field practices involved in the harvesting and preparation of the crop for market. A few other areas, where methods of especial interest are practised, were also visited.

The survey showed that the crop is not confined to holdings of any particular size-group. This factor has a direct bearing on the problem of preparation for market and results in a variance in the methods used. There are also local preferences for certain methods or for particular types of containers. Even greater variations are manifest in the varieties of sprouts grown, and rarely was the same variety found on any two of the farms visited. It was more common to find crops grown from strains of seed which are maintained selectively by growers each year. Some of these strains are made available to other growers throughout the country.

Considering the number of strains maintained, it is worth noting the following desirable characteristics, which should be taken into account.

1. The sprouts should be reasonably compact on the stem to ensure a good weight of crop, but not so compact as to be difficult to pick or to increase the chance of rotting and disease under certain conditions.
2. They should be solid, with leaves tightly clasping and smooth. Basal leaves which are not entirely clasping should be small.
3. They should be of good colour and able to maintain their colour. Many buyers prefer dark-coloured sprouts, and this may be associated with ideas that pale sprouts are stale. Certainly, however, a dark sprout looks more attractive than a light one in the market.
4. They should be round rather than oval or pear-shaped; the non-round types carry a higher proportion of stem to leaf tissue.

On the question of the most popular size, the situation seems a little confused, and no conclusion can be reached without considerable consumer research. There is a limited demand for a small "button" sprout, but it is the belief in some quarters that this is being met by the present production. The quick-freeze industry appears to be developing a demand for a medium-sized sprout, while one often hears that the modern housewife, probably activated by a desire for easy and quick preparation in culinary use, requires a large sprout. In my opinion, however, size is less important than quality. Solid, smooth, clean sprouts, with few excessive and no non-clasping leaves, will usually sell well, provided they are reasonably uniform in size. Uniformity of size comes into the picture at production point. A crop which is reasonably even will require less handling to make an attractive sample in the market than one which lacks uniformity.

Common Picking Methods The method of picking was the same on all farms and holdings visited. A picker takes two rows at a time with the receptacle for the picked sprouts standing between the two rows. Each plant is straddled, and the sprouts towards the picker, as he bends over the plant, are pushed off by the palms of the hands. Those facing away from the picker are pulled off by the fingers. Picking into non-rigid containers is facilitated by the use of a supporting cradle. This is frequently an appliance consisting of four upright metal rods held together by an encircling ring or rectangle at the base, and a part ring, or rectangle with an open side, set approximately one inch below the tops of the rod. The net or bag is then suspended within this framework with the bottom clear of the ground and the mouth hung over the tops of the rods. Such cradles are used extensively in the Vale of Evesham.

The frequency of picking is important to the quality of the harvested crop. The more often it is done the more uniform will be the quality of the crop harvested at any one pick. The general aim amongst the growers visited was to make 3-5 picks per crop in a season, but in a few instances they picked eight or nine times. The kind of season tends to determine the number, because of its effect on the condition of the crop, and in consequence, on demand. Three picks must be considered as the bare minimum necessary for any worthwhile crop and hardly sufficient to be satisfactory in a normal season.

Grading and Packing When grading and packing are carried out in the field, the sprouts which are not good enough to be marketed are discarded as they are picked and thrown on the ground. It is normal for any cleaning required to be carried out at the same time, the dirty, damaged or excess leaves being removed as the sprouts are put into the containers. Weighing is done between the rows or at collecting points on the headlands, where supervision for uniformity of quality, etc., can be carried out. This method of preparation for market is largely practised in the Vale of Evesham and adjoining districts.

Alternatively, grading, cleaning and packing may be done after picking, and this procedure, common in Bedfordshire and Cambridgeshire, generally results in a better market sample. For one thing, it is possible, when the weather is bad, to carry out the preparation for market under some kind of shelter.

In this method the sprouts are generally picked into skips or bags. Wire-bottomed skips are frequently used to avoid the collection of dirt, but in some districts growers prefer a bottomless skip, called a "pad", which has a

piece of sacking tied over it to form a bottom to which dirt will not adhere. When skips are used, they are usually emptied into large bags to be carried to the headland. The grading, cleaning, and preparation for market is done either on the headland or at some central point on the farm.

There are various methods of grading and cleaning, but the three main ones are: (a) over a hand-operated riddle; (b) by a potato riddling machine; and (c) by static screen. With (a) it is common for round riddles with a mesh of 3½ inches × ½ inch, to be used over trestles, or occasionally over tripod stands. The sprouts are emptied on to the riddles, which are shaken manually to remove loose leaves. Cleaning is done by rubbing away dirty and diseased leaves. Loose, over-mature sprouts (known as "blowers"), and those not fit for market, are removed. The "blowers" may be put into bags and sold separately, if there is a market for them. When filling bags a wicker funnel of the same capacity is frequently used. The funnel is filled whilst stood in the mouth of the bag, and funnel and bag are then lifted together from the ground to allow the sprouts to pass into the bag.

Some growers use potato riddling machines of the oscillating type for grading, the potato screens being commonly replaced by a screen which is again of 3½ inches × ½ inch mesh. With double-riddle machines horizontally operated it is possible to use screens which will give sized outputs according to market requirements. For example, a machine with two rectangular screens having 1 inch and 1½ inches respectively as their shortest mesh dimensions, will give an output in accordance with the requirements of the Ministry of Agriculture's Recommended Grades.*

After sizing or passing over the riddles, the sprouts move up the elevator, where cleaning and grading by subtraction may be carried out as required.

Another method of preparation for market, which was seen in operation in Suffolk, involves the use of static screens. The sprouts pass over a screen which has a slight slope and consists of a number of pieces of ⅜ inch rod set longitudinally to the flow of produce and about ½ inch apart. The produce is fed by hand along the length of this screen—a distance of about six feet. Trimming, cleaning and grading by subtraction are carried out before they pass off the end of the screen into the market containers.

In addition to these general methods of preparing and packing sprouts for market, mention should perhaps be made of preparation on benches, and the recent trend towards pre-packaging in consumer units (usually in transparent bags), and of trimming produce "ready for the pot". It is too early, however, to attempt any description of the latter.

Piecework Harvesting The Brussels sprouts crop is one which lends itself to picking on a piecework basis. Practically the whole of the crop throughout the districts visited is harvested under this system, although only regular farm labour is employed. Occasionally the regular staff work on a weekly wage system with a bonus based on the quantity picked. These practices reflect the constant need for speed to keep on top of the harvesting task.

Full-time supervision is rarely given to the picking labour, but it was seen in two instances where produce was picked direct into the market containers. Piecework picking is satisfactory where the sprouts are to be graded and

* These grades were defined in 1950 by the Ministry as a result of the recommendations of an advisory committee representing all sections of the trade. They are set out in Marketing Guide No. 6, which may be obtained free from the Ministry of Agriculture (Publications), St. Andrew's Place, London, N.W.1.

sorted later by workers employed at a regular wage, who can give more attention to quality and uniformity of market sample than to speed. This allows speedy picking, by what might be termed the "strong" labour, while the women and others not suited to field work can be used for sorting and grading under less trying conditions. Such an arrangement makes it possible to pick a given acreage frequently and, at the same time, attain a high quality and uniformity in the market pack.

During the survey, notes were made of the approximate outputs per man-hour on the various farms visited. The average rate of picking direct into market nets and bags was 4 units per man-hour; riddling and passing the produce over screens reduces this rate to 3½ units, but handling over machines at a central point again gave an average figure of approximately 4 units per man-hour. These averages were arrived at from growers' estimates, and the quality of the various outputs involved varied considerably. They indicate a balance of advantage in favour of handling over machines, in view of the more efficient use made of all types of labour.

No Standard Containers The two most widely used containers are nets and bags. The former is non-returnable, normally has a 1 inch square mesh and holds 20 lb. of sprouts. It is used extensively in the West Midlands. The bag is the ½ cwt. root bag, is returnable, and when used for sprouts takes 28 lb. Growers in the East Midlands favour this container, but it is not in exclusive use there.

There are factors in favour of both containers, but on balance the net is preferable, since (a) it is non-returnable; (b) its open construction permits ready judgment of the contents; (c) there is less danger from heating; and (d) damage caused by careless handling can be more easily seen.

Two rigid containers—the lettuce crate and the bushel box—are used to a limited extent. It is usual to pack 20 lb. into the former and 28 lb. in the latter. Occasionally half-bushel boxes are used, and sometimes Dutch-type trays. One grower visited was using a returnable box holding 12 lb. for marketing a special strain of small sprouts. Another was using Dutch-type trays to market sprouts which had been partially prepared for culinary use. In yet another instance, lettuce crates were used for bulking consumer units. None of these, however, can rival the sprout net in general utility.

DIAGNOSIS OF PREGNANCY IN FARM ANIMALS

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Early and reliable diagnosis of pregnancy in farm animals can do much to ensure maximum production. There is no single method applicable to all animals, but there are a number of proved clinical and laboratory tests which, taken together, should enable the veterinarian to provide an answer early enough to be of value to the stock-raiser.

IT is not known when farmers and veterinarians first used specific methods of examination to detect pregnancy in livestock. Certainly, advanced peoples of four thousand years ago were able to appreciate the significance of the physical changes associated with pregnancy in the human and to confirm the opinion with various tests, and since information gained from livestock has so often been applied to the human subject, it is possible that pregnancy has been detectable in farm animals for at least this period of time. However, in spite of the accumulated information on various aspects of breeding, it can still be difficult to state whether a particular female animal is pregnant. Although there are useful signs which to the experienced stockman suggest pregnancy, they are not sufficiently infallible to allow a diagnosis.

Production on the farm entails the design and maintenance of breeding programmes which, in turn, depend on the fertility of individual animals and the timing of pregnancies. Thus it is desirable to be able to determine that an animal has become pregnant and to know the expected date of birth, so that full use may be made of the arrival of the young animal. In dairy cattle and goats, the new-born animal may be of less interest to the community as a whole than the resulting production of milk, and since with this commodity it is usually important that the level of supply should be kept within certain limits, forethought and planning are essential. For different but equally valid reasons, similar thought and care are necessarily given to the breeding of pigs, sheep and horses. In all farm animals, therefore, it is very desirable to be able to determine the existence of pregnancy and the stage of gestation.

Unfortunately, there may be a wide gulf between the desirable and the attainable. Yet when a diagnosis has been made, the findings should be accurate and dependable, and the opinion must be given as soon as possible after mating. When the breeding programme has been upset by infertility, the diagnosis of pregnancy is even more significant—and frequently tends to become less easy to determine with certainty!

There are a number of physical differences between the pregnant and non-pregnant individuals of any species. Some of these may be visible and some may be felt by the hand, but others can be found only by special tests applied to materials collected from the animal's body. It is the detection and assessment of such differences which provides a basis for the expression of an opinion regarding the condition of the animal. In general, a sound opinion should take into consideration the fullest information and be based on a variety of tests, rather than rely on a single method of examination. This is especially true when considering those species in which the shape and size of the body tend to interfere with the direct methods of examining the

body contents by hand. Further, depending on the species, there are variations in the stage of gestation at which pregnancy may be detected, either by direct clinical inspection or by other methods. To some extent, also, the value of an opinion may be influenced by the experience and dexterity of the examiner.

Clinical Methods The clinical methods of detecting pregnancy depend upon the presence of certain anatomical features which may be appreciated by the eye or hand. These methods include external observation, handling of the abdominal contents through the abdominal wall (usually in the region of the flank), and handling the womb by way of the rectum. Occasionally, examination of the birth canal provides further evidence for consideration. The evidence obtained by such methods varies in its value, from being reliably diagnostic to being only suggestive of symptoms which, though frequently associated with pregnancy, may be present also under conditions of reproductive disease.

Among such signs which may be unreliable are swelling of the abdomen and disappearance of the heat periods. Even changes of the udder may mislead. It will be readily understood that gross clinical signs are more noticeable in young animals in their first pregnancy than in older animals which have undergone a number of pregnancies. Also, the changes increase in extent as gestation progresses and become more obvious with the approach of birth. When the unborn young is sufficiently large and active for its bulk and movements to be felt or seen through the lower regions of the flank, the value of the findings is obvious. Yet a negative finding is valueless, as it may not be possible clinically to detect the foetus on a particular occasion, even in advanced gestation.

Where the cow and mare are concerned, direct physical examination *per rectum* is the easiest method of certain evaluation. It permits, too, the most reliable expression of opinion at a period sufficiently soon after mating to be of practical value. Unfortunately, clinical examination of the ewe and female goat is restricted to hand pressure through the right flank, and this yields positive information only during advanced gestation, when it is too late for the findings to be really valuable. Neither of these methods of examination can be applied to the sow, since her conformation does not permit handling of the uterus.

The beating of the foetal heart may be heard and recorded electrically. Such techniques may be interesting and of value within certain limits, but they are not readily applicable to the larger species, although of possible use to detect pregnancy in the ewe and goat. The techniques of radiography are also applicable to these smaller species, but the volume and depth of the abdomen and its contents interfere with their use with the mare and cow. These methods of examination are, moreover, of no value during the early stages of pregnancy and are relatively expensive.

Laboratory Tests There are a number of tests which may be carried out under laboratory conditions to detect certain detailed changes in the dam, associated with the presence of specific substances in the various fluids and materials execreted by the body. These tests may be either biological or chemical. The first involves the use of small animals, such as mice, rats, toads, guinea-pigs and rabbits, while the results of the second method are assessed on the basis of chemical reactions. The materials commonly used are blood, urine, faeces, milk, and mucus from the womb. In some instances, too, such materials are subjected to physical methods of examination and evaluation.

There are obvious advantages in the application of such laboratory tests, especially in those species which do not lend themselves to direct examination. Unfortunately, variations occur between the species regarding the nature and quantity of specific substances excreted during pregnancy, so that a test which may be applicable to one may be of little or no value when applied to another. Thus although the blood serum of the pregnant mare yields a specific hormone in detectable quantity, that of the cow does not. Further, the urine of the pregnant mare contains a readily demonstrable hormone which is not present in the cow's urine.

The various tests which have a practical value and application are relatively few. On the other hand, numerous attempts have been made to devise tests with the inherent attributes of accuracy, simplicity, cheapness and freedom from accidental error. Most have failed to achieve their aim. Occasionally, there appear reports of tests which could never be reliable because they are influenced by gross physical and chemical properties common to the fluids of both pregnant and non-pregnant animals. We have carried out observations at Weybridge on a recently described urine-pregnancy test in cattle, using an oxidation-reduction indicator, sodium benzonindophenol. Biochemists were naturally doubtful of the value of such a test, although its success had been much publicized. We found that it did *not* differentiate between pregnant and non-pregnant females. Difficulties of a rather similar nature have arisen in the evaluation of a test based on the presence of substances in bovine faeces, the results tending to be influenced by the cow's diet rather than by the condition of the uterus. Also, a number of laboratory tests are impractical because of the expense and difficulties involved in maintaining costly and delicate equipment which can be used only by highly-trained chemists. For this reason, no practical use is made, in pregnancy diagnosis, of the fact that progesterone can be detected in a high proportion of blood samples from pregnant cows.

The diagnosis of pregnancy must, however, depend on positive facts; hence the following brief summary is given as a guide to the accepted methods applicable to the various species of farm animals.

Diagnosis in the Cow and Mare There is no simple laboratory test which can be used for the early diagnosis of pregnancy in the cow. Certain signs are readily noted by stockmen, but an accurate diagnosis must be based on the results of a clinical examination carried out by a veterinarian. Usually, this will yield reliable evidence from the eighth week onwards, and can give positive findings at an earlier stage in heifers. Useful supplementary evidence may be obtained by external palpation and by estimations based on the physical examination of genital mucus. It should be noted, however, that, in the presence of genital abnormality, the foetus may die during gestation and be expelled. In the later stages of pregnancy, this occurrence may be noticed as an abortion, but there is a chance that the "slip" may pass unseen, especially in the earlier stages. Should this occur after pregnancy has been diagnosed by the "rectal" technique, the veterinarian may be blamed for having disturbed the pregnancy or, alternatively, be told that his diagnosis was faulty. Either assumption is unfair and unwarranted, but in these circumstances it may be thought advisable to avoid the very early diagnosis of pregnancy. However, it should be borne in mind that in the investigation of infertility the earliest possible assessment is essential, since it allows the differential diagnosis between failures of conception, early foetal death, and abnormalities of the "heat" periods.

As in the cow, the direct physical examination of the internal genital

organs of the mare should allow an accurate diagnosis after the eighth week. The findings of this examination can be supported by a study of mucus collected from the anterior vagina—the cell content and physical characteristics being important. Laboratory tests can also give very accurate results. The blood serum can be tested for the presence of specific hormones, which are usually detectable between the seventh and fourteenth weeks of gestation. Further, biological and chemical modes of examination can be applied to the urine, because the pregnant mare excretes detectable amounts of a particular hormone after the ninth week. At such an early stage, the biological methods are most accurate but, after the fourth month, chemical techniques of evaluation are very reliable too.

The Smaller Animals The clinical methods of external handling and consideration of visible signs are applicable in the ewe during the eight weeks before lambing. The right flanks offer the best route for hand pressure. No laboratory tests are as yet available, although many techniques have been tried and much work is being carried out in the investigation of possible methods. Feeling a blood vessel supplying the womb, by finger *per rectum*, may allow detection of " thrilling ", but this will be rather too late in pregnancy to be of real value. Radiography is applicable but is scarcely practicable. The shepherd, of course, gains useful information from the nature of the udder fluid.

The pregnant uterus of the she-goat can be felt through the region of the right lower flank, but only during the last third of the gestation period. We have found that the rectal route allows part of the womb to be examined by one finger in the non-pregnant young female. The weight of the kid tends to pull the womb further into the body cavity and out of reach. The detection of such alteration can be a valuable guide at about the sixth week after service. The general physical characteristics of the cervical mucus, including increased tenacity and firmness, provide useful information after the fourth week. Sometimes, it is possible to palpate the blood-vessel " thrilling " during the later stages of pregnancy, by inserting one finger in the rectum. Detection of the foetal heart, either by sound or by the electrical recording, is possible late in gestation, but reliance on such techniques is not practical. The use of radiographic methods to reveal the skeletal structures of the foetus can be used because of the relatively small bulk of the dam.

The anatomical features of the sow do not allow the uterus and its contents to be palpated from any direction so that, even when the time of parturition approaches, it is possible only to state that she *may* be pregnant. The problem of foetal resorption complicates this aspect of diagnosis. There are, however, biological methods which allow the detection of hormone in the urine of pregnant sows between the third and fourth weeks after mating.

The livestock industry would greatly benefit by making the fullest possible use of the methods already available for the routine diagnosis of pregnancy. Such demand would encourage everybody concerned and would tend not only to multiply the field and laboratory services available but, also, to increase the reliability of the results obtained. In this way, much could be done to improve the fertility of farm animals and to ensure that production is maintained at the highest possible level.

THE MATING INSTINCT

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An essay-review of a new book by Lorus J. and Margery J. Milne, published by Robert Hale, 15*s*.

TWO professional zoologists—an American professor and his wife, both well known as popularizers of science from their contributions to the *Scientific American*, the *Atlantic Monthly* and similar publications—have given us a most stimulating, happily-veined treatise on an important aspect of animal behaviourism. "Anything so nearly universal as sex," they say, "must have immense importance"; and this, briefly, conveys both the viewpoint of the authors and establishes the *raison d'être* of the book. The wealth of amazing and amusing descriptions pertaining to patterns of animal sexual behaviour, which they present, is both entertaining and instructive.

As a whole, the subject-matter does not provide food for serious criticism, since the book is essentially a factual compilation, though lightened by humour. The authors are to be congratulated on having completed a task which must have involved arduous searching of the zoological literature. Their sins, if such can be named, are therefore of omission rather than commission, and are pardonable in a book of this character. If I were to raise a mild voice of criticism, it would be directed at the lack of any serious attempt to synthesize the many facts into general principles of behaviourism, with a view to enhancing the professional status of the work. Even a semi-technical recapitulation of each chapter would have some appeal to the zoological specialist harassed by the problem of keeping abreast of the times in his own special field without neglecting the subject as an entity. This would have partly obviated the risk of tiring the general reader by over-exemplification and the danger that he might not be able to see the wood for the trees. The presentation has sacrificed prestige in an obvious attempt to achieve popularity; it lacks both the Darwinian mastery in rationalizing numerous facts and the Thomsonian gift of adorning them in dignified phraseology. Nevertheless, the ten chapters, with titles aptly chosen to herald their contents, march in logical arrangement as the authors elaborate the *sequelae* of the mating instinct.

Finding a Mate For bisexual animals, a necessity for survival of the species is the discovery of a suitable mate. Indeed, there is a school of thought which maintains that animals are limited in abundance by the difficulty they experience in finding their requirements, and that the success of searching animals can be expressed mathematically in the so-called "competition curve". Even where fertilization is external, as in many aquatic animals, the sexes must be in fairly close proximity to ensure union of the shed sexual products, since the fertilizable period of shed ova is limited and the vitality of sperms still more so. Eggs of the pike, for example, are unfertilizable after ten minutes, and the sperms of certain freshwater fishes are non-viable after two minutes.

It is not surprising, therefore, that after describing many striking secondary sexual characteristics, and having indicated that the male is the more expendable sex, the authors devote considerable space to the first link in the chain of events leading to union of sex-cells, namely, recognition of a recep-

tive mate. Far from being a random search, mate-finding, among vertebrates at least, is a highly organized search which involves one or more of the senses of sight, smell, sound, touch, and even taste. Vision is the primary key in many diurnal animals; and some nocturnal animals, such as owls, and certain insects, have special lenses which enable them to find a mate by starlight. Fireflies produce their own light, and the sexes find one another by a code of flashing signals. Thousands of animals in the perpetual darkness of ocean depths find both food and mates by luminescence, but for many other species there, the flavour of a mate is the exciting stimulus. Sea-cows and whales rely upon chemical trails for mate-finding. "On land," say the authors, "the role of scent in bringing the sexes together has to be experienced to be believed"—exemplified by reference to moths, lizards, muskrats, bitches and tabby-cats.

Taking a Mate Having recognized a potential mate, the next hurdle for the male is to bring her to close proximity. This often means pursuit, sometimes combat with competitors, and occasionally courtship; for many females exhibit a coyness which has puzzled eminent biologists. Both chase and combat may, however, have survival value through elimination of the less fit. Darwin interpreted many secondary sex-characteristics as being an outcome of combats for coy females, who look on with arousing sexual interest until their coyness disappears. Courtship antics of the males of many birds, fishes, and spiders, and the "song" of crickets and cicadas, are other forms of enticement. Even the lowly newt indulges in a form of courtship, which, surprisingly, is not followed by coition, but fertilization is ensured by the sperm-packet from the male being picked up by the cloaca of the female.

In birds, the phenomena of display and courtship attain a complexity unknown in other creatures, except mankind; and song is often a feature of this ritual, which attracts the female, excites her, and eventually achieves her co-operation. Birds of highly elegant plumage and those capable of elaborate song never engage in serious combat; they conserve their energies by resorting to a psychological war of bluff and threat. A flowing mane and a copious beard may camouflage serious deficiencies. The display of several male birds actually induces, in their prospective mates, a hypnotic state of passive receptivity, involving a reversion to infantile behaviour.

Great differences are observable in the frequency with which the female will accept a mate and in the timing of receptivity within the sexual cycle, one of the most unusual instances being the cow of the fur seal, which mates almost immediately after parturition, and thus is pregnant for at least 364 days each year. As to choice of a male partner, Darwin considered that the females of many species actually exercise a degree of aesthetic fastidiousness, but Lloyd Morgan seems nearer the truth when he says: "The most vigorous, defiant, and mettlesome male is preferred, just because he alone affords a contributory stimulation adequate to evoke the pairing impulse."

One of the most fascinating chapters, in this book of many fascinations, is devoted to the mechanisms of sperm-transference to the female—the end-all of search, pursuit and courtship. Some are so fantastic in their ingenuity as to have almost a Wellsian character. Even a knowledgeable biologist will find both enlightenment and entertainment in the pondering of this chapter.

Some of the harrowing details of courtship could well have been replaced by fuller treatment of topics such as the effects of population-density upon sexual behaviour. About twenty years ago, one of my students and I showed that there is an optimum density for frequency of copulation in grain weevils.

There are many other instances of mating being modified by the proximity of other members of the species, and density can influence the sex-ratio of the population. Crowding the parthenogenetic females of certain water-fleas induces bisexuality.

Sex Expression The significance of hormonal imbalance in the interpretation of intersexuality is also touched upon. Hereditary constitution of the individual does not change, but the outward expression of it can vary within wide limits under the influence of secretions from proliferating embryonic rudiments, as in birds and mammals, or through the absorption of excretions from the opposite sex, as in some invertebrates. The few authentic cases of a hen becoming a functional cock are mentioned, together with an assortment of creatures in which sex-reversal or sex-alternation is the normal occurrence; for example, certain starfishes and oysters, respectively. *Teredo*, the shipworm, may change its sex twice within a year. Among insects, the mutational "sex-mosaic" makes a rare appearance, with the resulting behavioural confusion of flies pursuing females with which their coition is a physical impossibility.

The final chapter—entitled "Why Sex?"—should logically have been the first, but perhaps the more rigidly scientific dispensation accounts for its relegation. Biologically, the significance of sexual reproduction lies in the production of species-variants, of which some are better able than others to contend with the vagaries of environment, so that the mechanism has survival value through minimizing the hazards of extinction born of calamities. As the authors put it: "The versatile, rather than the meek, inherit the earth. Sex aids that versatility." I would point out, however, that in the practical application of the hereditary mechanism, the husbandman deliberately restricts versatility by directive mating, and takes upon himself the liability of cushioning the vicissitudes of environment.

Man's age-long dream of the willed determination of sex has not yet materialized, but he should be forewarned by the consequences of the instinctive functioning of sex control in the honey-bee—(a) restriction of reproduction to one female in the community, (b) enslavement of sterile females as workers, (c) subordination and near-elimination of the males. Sexuality intrudes at puberty in the life of man, raising problems of how to integrate this new impulse with personality and of how to reconcile idealism with the facts of life and living. Problems of adolescence were never more acute than they are today, especially among the classes of society in which the marriageable age is tending to recede; so that many parents will welcome the opportunity of presenting this book to their older teenage offspring—after having read it themselves.

CROPPING WHEAT BY PLOUGHING AND SOWING

ARTHUR AMOS

Wye, Kent

Mr. Amos suggests that the old-established Kentish practice of " one-way " ploughing and broadcasting and harrowing of cereal seed immediately behind the plough might be adopted with advantage on fertile soils in other parts of the country.

EVERY observant farmer knows that freshly-ploughed soil, if of a loamy texture, crumbles readily immediately after this cultivation. It does not happen when there is a lot of clay present, but it is certainly true of the medium soils. But if such freshly cultivated soils are once allowed to become wet with rain, or are frozen, then they become sticky and do not again crumble easily until after a period of drying weather.

Wheat is normally cropped for best results from October to the end of February, but if sown early on fertile land it is liable to become " winter proud " and may subsequently lodge. Thus on such soils it may be desirable to defer sowing until November. But when drilling is delayed until then, fields which have been ploughed earlier will have become wet and sticky and suitable spells of dry weather may not occur. The drilling may then either have to be muddled through or delayed too long.

Under such conditions, the practice of sowing by broadcasting and harrowing-in immediately after ploughing has much to recommend it. Indeed, on the farm which I manage practically all the wheat grown during the past fifty years has been so cropped. During that time I do not remember one failure, and frequently the crops have been very good.

Fifty years ago much of the land in Kent was ploughed " one-way " with the Kentish wooden turn-breast plough—a complicated but beautiful implement. The essential feature of this was that the breast was reversed at the end of the row so that all furrows were turned in one direction, no open furrows were left, and the entire field remained level after ploughing. At this time wheat was generally taken after clover, and each furrow was pressed with the wheel of a narrow-wheeled, horse-drawn cart immediately after it was turned. This tucked in any green and left a firm wheel track to receive the wheat seed, which was broadcast by hand each day and harrowed-in to within three furrows of the end of the day's ploughing. The three furrows were left unharrowed to show where to begin broadcasting next day. Lastly, when the cropping of the field was finished, the field was cross-harrowed to complete the covering of the seed as soon as possible.

Later, when potatoes were introduced into the rotation and the Kent balanced plough was developed, the practice was modified. Wheat now followed potatoes, but again each furrow was pressed with a narrow-wheeled cart following immediately behind the balanced plough. The wheat was still broadcast by hand each day behind the plough. When tractors replaced horses, the double-furrow balanced plough took the place of the single-furrow, and then the cart-wheel was supersded by the two-wheeled furrow-press drawn by the plough.

Finally, the Kent double-furrow balance plough has given place to the new double-furrow reversible plough, which, like all the other ploughs mentioned in this article, is designed to start at one side of the field and turn all

furrows in one direction, thus leaving the whole surface of the field level. It has not been found possible to hitch a furrow press to this plough, but when the plough is properly set to turn the furrow accurately, with the extension of the breast kept well down in its proper place, it will be found that the corner of the furrow will crumble off as it is rolled completely over by the breast extension, leaving a narrow crease between each furrow.

Under these conditions, it is found that when the wheat is broadcast over the ploughing and is harrowed in, a lot of the seed finds its way into creases between the furrows produced by the breast-extensions and into the cracks of the plough furrow itself. The present practice is to spread the seed with a drill from which the coulters have been removed, but this operation could be done equally well by some types of manure sower.

Advantages of Sowing behind the Plough The advantages of the practice are many. First, the wheat can be sown at any time when the field is suitable for ploughing. This means that the wheat can be cropped at the optimum time, which for autumn wheat on my fertile loam is the latter half of November and the early part of December, and for spring wheat January or early February. Even in the difficult season of 1954-55, all my autumn-sown wheat was still cropped between the middle of November and the end of December, and by mid-February it was well up with a regular plant. All my spring wheat was in by February 3, in a good bed with a nice crumbly surface.

Secondly, when wheat is broadcast and harrowed in, the grains are well scattered so that rooks cannot "hunt the furrow". Consequently, there is much less bird damage than in drilled corn. Thirdly, when the field has been harrowed immediately behind the plough, the surface is left rough and nubbly, so that both drainage through the furrow and aeration are better. Fourthly, the seedbed having been left rough and nubbly, the conditions for spring cultivation (harrowing and rolling) are more suitable and, if desired, grass and clover seeds can be sown successfully. Finally, the yields are satisfactory, rarely being less than 30 cwt. and sometimes reaching 2 tons per acre.

There are, of course, some disadvantages to the method. The costs of sowing, for example, are rather greater. Half a bushel more seed will be required per acre, because some grains will be left on the surface of the field and will be taken by small birds, and some time will inevitably be lost by the broken time of the men engaged with tractor and drilling sowing. The ploughing must also be done accurately and the operations need to be carefully supervised. For the conditions on my farm, however, I am convinced that it gives me good results, and I venture to suggest that the practice may have wider application on soils kept in high fertility where the modern reversible ploughs are in use.

THE FARMING MERCHANTS' SERVICE

A. W. LING, M.Sc., N.D.A., DIP.AGRIC., and
C. E. P. CHATAWAY

The important services which the agricultural merchant contributes to the efficiency of the modern farming industry are all too often taken for granted. This article is a timely reminder of some of them.

MANY things in farming, as with life in general, are taken for granted. This is as it should be, insofar as agriculture is concerned, because the farmer today is fully occupied with his task of producing more and more food from less and less land, and in consequence has little time to ponder what is going on behind the scenes. Such bodies as the National Agricultural Advisory Service and their official advisers, the research worker, the veterinarian, and the agricultural merchant, are those to whose joint efforts the farmer looks for information and guidance in practical and understandable terms.

The representatives and advisory staffs of the merchants enjoy the wide confidence of the farming community, and by their very numbers, training and experience constitute a very powerful force in bringing up-to-date knowledge in their specialist spheres on to ordinary farms. Above all, the merchant is essentially concerned with the economic application of technical knowledge to modern farming practice. He has to be, in view of the millions of pounds of capital invested in trade and commercial enterprises. Much of this money is directly used in service to agriculture, so that the merchant must be completely satisfied that it is in turn employed profitably by the farmer for their common benefit.

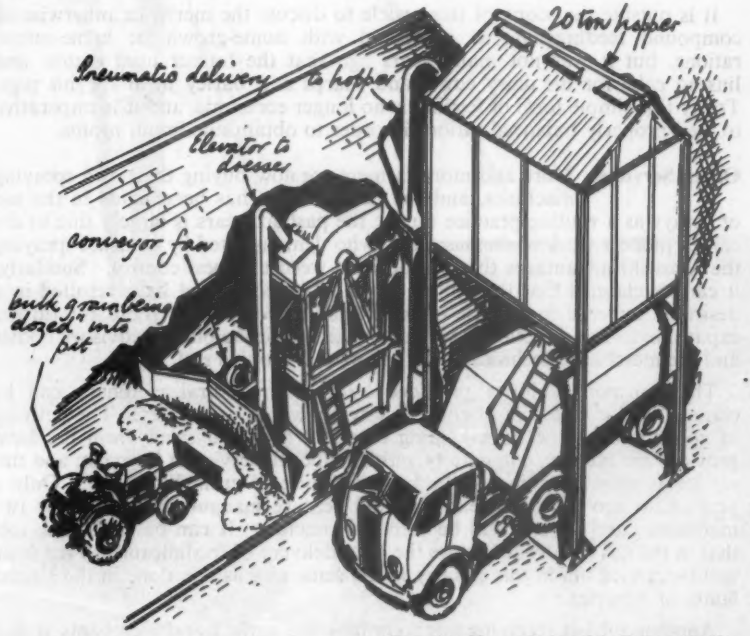
In order that all working members of the trade should have the necessary technical background to add to their commercial knowledge, the National Association of Corn and Agricultural Merchants saw fit in 1945 to found its own institute. Naturally, in training its members the Institute makes the fullest use of the agricultural colleges and every other facility made available by the Government. During the ten years that the Institute courses have been in operation there has been abundant proof of their value, through its members, to agriculture as a whole.

Farming is a progressive business, and as the efficiency of it has increased so has that of the merchant. Most country merchants have extended their operations far beyond their early functions of compounding or supplying animal feedingstuffs, seeds and fertilizers. Seed and grain drying and cleaning, seed inspection and certification, and the provision and application of fungicides, insecticides and weedicides are today common services.

Seed Quality The basic operations of the true corn merchant involve him in the purchase of home-grown grain, and now that restrictions have been lifted, the application of his specialist knowledge of the best markets for the disposal of all classes of grain is of the utmost importance. With malting barley, for example, he must have the most intimate knowledge not only of the grain itself but of the trade as a whole, so that he may satisfy the particular requirements with regard to quality and type of grain for all classes of buyers both at home and abroad. Quite obviously, this skill and technical ability can be gained only through years of experience and diligent study to achieve a complete understanding of the subject.

The ever-increasing use of the combine harvester has emphasized the need for efficient and rapid drying and cleaning of corn, and so the installations of cleaners, driers, and storage bins with bulk intake are now a characteristic feature of every progressive country merchant's business.

Many merchants have also extended their operations in connection with the production and marketing of seeds, and apart from the cleaning and drying of them, dressing against seed-borne diseases has now become an almost universal practice.



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Method of loading bulk grain transport from overhead storage hoppers on a Hampshire farm. Ten tons can be loaded in 5-10 minutes, and no sacks are needed at any stage.

A few years ago it was not uncommon for only five seed samples out of a hundred offered for sale at market to be true to type. In many cases today the merchant's work starts in the field before the seed arrives at his premises. Thanks to the National Institute of Agricultural Botany and its Merchants' Field Approval Scheme, the purchasing farmer can be reasonably sure that he is getting the variety or strain that he is seeking and "rogues" are not likely to spread all over the farm. In some instances this scheme is operated by the merchant alone; in others it is a joint effort between the growers and the merchant through Seed Growers' Associations. The very large acreage of herbage seeds, particularly the Aberystwyth strains, which are now grown in this country are all contracted for by merchants who handle, clean, and market the produce of these crops. It is worthy of note that many merchants have their own officially recognized Licensed Seed Testing Station manned by qualified staff.

Feedingstuffs The compounding of animal feedingstuffs is another example of work that goes on behind the scenes. When, for example, a farmer orders a load of cubes from his merchant, he knows very well that the consignment, complying in all respects with the nutritional and legal standards required, will arrive on time, but he may not realize that the delivery of the cubes actually started several months before when some of the primary ingredients, such as ground nuts or maize, left their native shores. The merchant has to organize and finance many huge operations, including the importation of "sun-cured proteins and starch", upon which the success of our farming enterprises and the health of our livestock are so dependent.

It is outside the scope of this article to discuss the merits or otherwise of compound feedingstuffs as compared with home-grown or home-mixed rations, but it was not many years ago that the farmer used cotton and linseed cake for his dairy cows, and sharps and barley meal for his pigs. Today this simple form of feeding is no longer economic, and it is imperative to feed properly balanced rations in order to obtain maximum profits.

Other Services More and more farmers are now buying their own spraying machines, and the progress that has been made in the use of sprays as a routine practice during the past six years is largely due to the earlier pioneer work of the merchant, who demonstrated by contract spraying the financial advantages that accrue from weed and pest control. Similarly, it can be claimed that the united efforts of all concerned have resulted in a desirable increase in the use of fertilizers. That there is room for further expansion in this direction is well recognized, and the official advisory bodies and the merchant's technical staffs are working to this end.

The transport facilities provided by the agricultural merchant can be claimed as one of the most efficient services which he renders. The delivery of goods to, and the back-loading of grain, hay, and straw from the farm provides the farming community with an efficient service at low cost; and this service is now extending to the bulk handling of grain by tanker. Only a year or so ago it was an experimental venture inaugurated by one or two merchants, and soon it will be common practice. It can be envisaged, too, that in the not too distant future the bulk delivery of feedingstuffs to the farm will be carried out in this country in the same way as it is done in the United States of America.

Another subject receiving attention by some agricultural merchants is that of the aerial application of fertilizers and sprays. The use of aircraft, both fixed winged and helicopter, for this purpose is commonplace abroad, where conditions are probably more suitable than in the United Kingdom. However, where this process has been used in this country it has led to very satisfactory results, as in the case of the distribution of fertilizer on inaccessible terrain, which has given outstanding results and provided first-class grazing from land which was formerly merely an exercise ground.

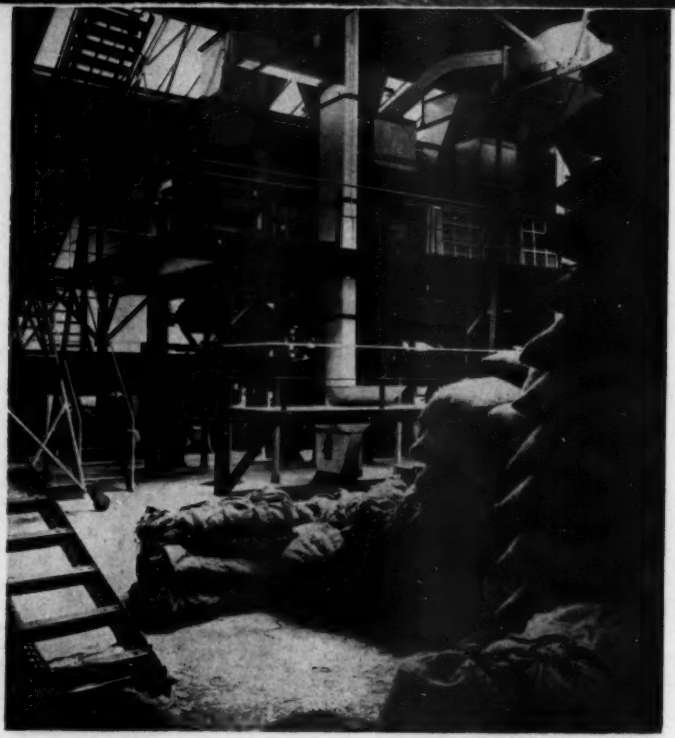
Whilst, of necessity, the merchant is a business man, he has to meet his farmer friends many times throughout the year, year in and year out, and the farmers' successes or failures are in some measure dependent upon the wisdom and knowledge of his merchant. In any case, if the latter, or his representative, offers the farmer advice on any farming matter he has to stand by the final result.



Photo: *J. W. Kitchen*

Quayside loading of seed





Photos: *Salisbury and Winchester Journal and John Harris*

Fertilizer distribution from the air.

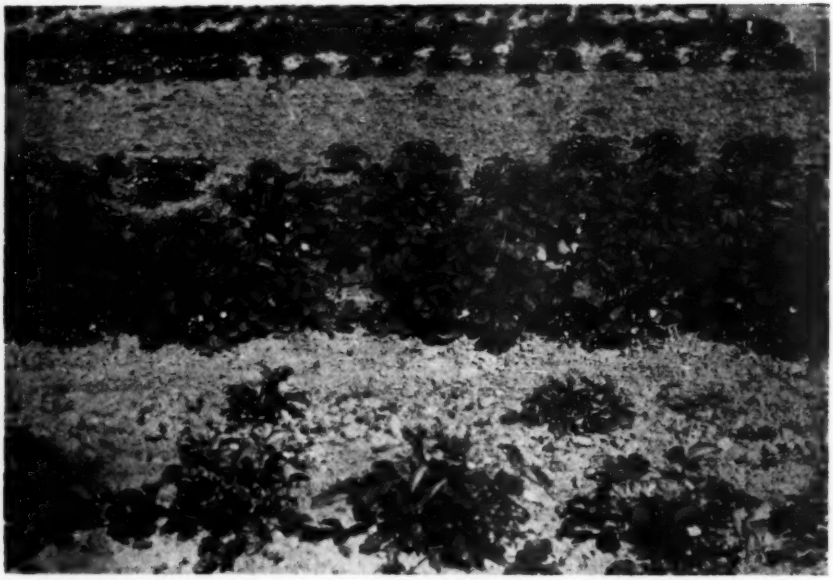
Clean seed of good quality.

Crops not Rabbits (Article on pp. 313-4)



A rabbit-infested field in Wiltshire is being farmed again after myxomatosis has taken its toll. *Below*, the same field this year carrying a bumper crop of wheat.





Red Core Disease. The strawberry variety C.I. (now known as Cambridge Vigour) proved resistant to the strains of *P. fragariae* when grown at Botley in May 1952. Dying plants of Madame Lefebvre can be seen in the foreground.



Photos: *C. F. Cheal*

Climax, July 1952, showing (*left*) wilting in plants grown on flat land, and (*right*) plants grown on ridged land.

THE SOUTH HAMPSHIRE STRAWBERRY PROBLEM

W. F. CHEAL, D.I.C., N.D.A.

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Trials on Red Core-infested land at Botley show that the soil structure of the Hedge End soil series shares with the fungus disease the responsibility for the poor strawberry crops obtained by local growers.

THE evidence available to the Botley Experimental Horticulture Station in 1946 at the beginning of an investigation into the reasons for the poor crops obtained by South Hampshire strawberry growers consisted mainly of information from surveys. An examination and classification by Dr. F. F. Kay (1) of the soils of the South Hampshire strawberry-growing area (that is, the land between the coast and a line drawn parallel to and 5-6 miles north of one from Southampton to Fareham, and containing the districts of Botley, Burlesdon, Hedge End, Wickham, Warsash, Swanwick, Sarisbury and Titchfield) had shown that quite a number of the twenty soil series found there suffered from impeded drainage. On the other hand, general reports from other investigators drew attention to the prevalence of Red Core disease, *Phytophthora fragariae*, Hickman. As far as the growers were concerned, the ravages of Red Core disease in Lanarkshire, where it had threatened to ruin the strawberry-growing industry, coupled with the fact that the most common variety grown in south Hampshire was the highly susceptible Madame Lefebvre, focussed attention on this fungus disease as the main cause of their misfortune.

The symptoms of Red Core disease are, of course, well known.(2) The organism is quiescent in the summer months, and the winter damage to the roots becomes apparent in early spring when the developing foliage, unable to obtain sufficient supplies of water from the restricted root system, wilts and dies.

The soil at Botley Experimental Horticulture Station was known to be infected with Red Core disease when the N.A.A.S. took over the holding from the Hampshire County Council in 1946, and at the outset susceptibility trials of eight strawberry varieties were laid down. On another plot the soil infection of *P. fragariae* was purposely built up by planting it with Madame Lefebvre. Judging from the amount of Red Core disease apparent in these plants, the soil infection was increased by the second year to a point where it would provide the severest field test to any subsequent strawberry varietal resistance trial grown there. Ten varieties were then planted out on this second plot. In both these susceptibility tests variations in soil infection were dealt with by interplanting the plots of the varieties, which were each in six randomized replications, with a row of susceptible Madame Lefebvre plants. (3, 4, 5)

The resistant variety Climax was included in the first varietal susceptibility trial, but no trace of any Red Core disease was found in any of the Climax root systems examined. It was concluded, therefore, that the strains of *P. fragariae* in the soils at Botley, as far as we could ascertain, did not include any of those that attack Climax. The other strains, however, were particularly virulent, and the remarkable difference in crop yield of 6 tons

was recorded between one resistant variety (C.I., now known as Cambridge Vigour) and Madame Lefebvre in the second trial.

A Drainage Problem During 1948 all the varieties in the susceptibility trials were afflicted with a severe wilting, leading to a complete dessication of the foliage beginning in July soon after the fruiting season. An exhaustive search was made by mycologists for causal organisms, but it failed to reveal any specific parasites. Moreover, in the following year, Climax strawberries planted in the gaps left by the wilting losses (and in one case a whole plot had been lost) did very well. There was also no response in plant growth to treatments shown by West and Hildebrand(6) in Ontario to improve the population of favourable micro-organisms in the rhizosphere of the strawberry plant.

In general, all the evidence concerning the cause of this summer wilting discounted plant parasites and pointed to the trouble arising from bad soil conditions.

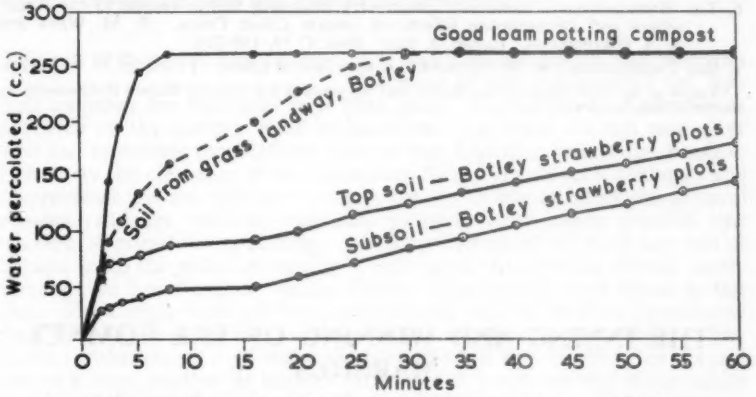
Following this conclusion, and parallel with the second varietal susceptibility trial, two other series of experiments were established, one with Climax strawberries on ridged and flat land manured with farmyard manure, and another series with Climax strawberries on plots green manured with soya beans, field beans, kidney beans, ryegrass and red clover. Unfortunately, these trials were curtailed by the closing down of the station, but root development studies and observation by independent witnesses in the first two years showed clearly that soil ridging was highly beneficial. No conclusions at all could be drawn from the green manure trials. Nevertheless, there appeared to be little doubt that during those years on the Hedge End soil series there was a drainage problem which could by itself have serious consequences on a strawberry plant. Thus this work supported the surveys of Dr. Kay with the results of field experiment.

Some Laboratory Evidence on Soil Structure One of the difficulties during the six years of the trials at Botley was the lack of any reliable laboratory technique for quickly assessing soil structure to go with the field studies of Red Core disease. In the early stages of the investigation, however, our attention was drawn to soil characters which influenced day-to-day cultivations. The soil capped very easily following rain and, to maintain good aeration, it was essential to cultivate the land and break the cap just as it was forming; to allow it to dry hard was fatal to good husbandry. Needless to say, the humus content of the soil was low. At the same time, violent rainstorms could cause marked surface erosion.

As the results of the ridged and flat land strawberry experiments became apparent, an attempt was made to demonstrate the bad soil characters on the laboratory bench as well as in the field. Several methods were tried, and finally a comparison was made of the percolation rates of soil samples from the top and sub-soil of the strawberry plots with soil taken from the adjacent grass landways and a standard potting soil used at a local nursery. The two grass landways, which were both 12-15 feet wide, were of good pasture and, during the six years of N.A.A.S. tenure, had been kept closely mown.

Good results were obtained with this test, which was repeated successfully with fresh samples of soil on several occasions. The method was simple. Equal quantities of the soil samples were placed in identical glass funnels, in which a piece of glass wool or some similar material had previously been placed to prevent the soil falling through the tube of the funnel. Water was

then poured on the soils in the funnels to percolate through into measuring cylinders beneath, and the time taken was recorded. The figure below gives the result of one of these tests. The great difference between the percolation rate of the unploughed soil from the grass landways and the tillage under strawberry beds shows up very clearly. The method is rather crude, but it serves a very useful purpose in emphasizing to an observer that the successful drainage of soil requires something more than the insertion of pipe drains: the soil texture must allow percolation. This fact is not always appreciated, and, furthermore, the amount of deterioration of some of these Hampshire strawberry soils is not fully realized by many growers.



Results of percolation tests with 350 c.c. water through 250 c.c. air dried soil.

About two years after the work at Botley ended, the technique for the study of soil structure began to receive more attention. This was brought about partly by the introduction of synthetic polyelectrolytes to the commercial market for the improvement of the physical condition of soils. The importance of soil structure is also one of the factors now considered in many field experiments—for example, in the grassing down of hops in the West Midlands.

Mr. J. O. Jones, the N.A.A.S. Advisory Chemist in the West Midland Province, has recently adapted the wet sieving technique of Hedrick(7) and Vodel, with which he has made some preliminary measurements of soil aggregation from plots of various agricultural treatments, and he readily undertook to examine some soils obtained last February from the Botley Experimental sites. Fortunately, the new occupier of the former Botley strawberry plots had not then carried out his intention of ploughing the grass landways, and comparative samples to those used in the percolation tests were obtained.

The wet sieving method is the subject of serious criticism by some research workers but, nevertheless, the results here showed differences of considerable magnitude in the percentage aggregation of the two soil samples, amounting to about eight times the aggregation in the soil from the grass as compared with the tillage sample. Coupled with the information given by the percolation rates, they afford very strong support to the conclusions drawn from the results of the Botley field investigations into the causes of the South Hampshire strawberry problem. These are that the Red Core fungus is not the only important factor for growers and plant pathologists to consider: soil

texture also plays a big part in the Hedge End soil series, if not in the others which Dr. Kay classified as of similar grouping.

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* Copies of the Final Report of the Station may be obtained free from the Ministry (Publications), St. Andrew's Place, London, N.W.1.

THE INNING AND WINNING OF THE ROMNEY MARSHES

NIGEL HARVEY, M.A., Q.A.L.A.S.

The agriculture and drainage system of Romney Marsh have often been described. But the story of the "innings" which won this rich farmland from the sea is less familiar.

COLLOQUIALLY, "Romney Marsh" means the whole of the great, green sheep-strewn peninsula, some 60,000 acres in extent, which lies between Winchelsea, Hythe and Dungeness Point. But the term is more convenient than accurate. The true Romney Marsh covers only a third of this area, and the remainder is divided between the Denge Marsh, the Walland Marsh, and the Pett Level. Nevertheless, it is right that Romney Marsh should have given its name to the whole of this flat and fertile territory, for it is the oldest of all the marshes, and the first to be won from the sea by the power of man. With its reclamation began one of the greatest of all the land-making epics of our history.

In ancient times, this huge area formed a wide, shallow bay where "the washings of the Weald", brought down by rivers from the high land behind it, slowly accumulated as alluvial flats. At high tide, much of it was under water. At low tide, great stretches of glistening mud, interlaced by innumerable channels and watercourses and broken by occasional banks of shingle cast up by the tides, were exposed. In the stiller waters along the coast and in the protected lagoons created by the shingle bars, vegetation grew and held the drifting particles of silt. The more the silt settled, the more the vegetation grew; the more the vegetation grew, the more the silt settled. And in this process of natural change lay a prophecy of things to come. For it was probably observation of the phenomenon of marsh created by accretion and surfaced by plants emerging from unstable mud that turned men's mind to thoughts of reclamation.

THE INNING AND WINNING OF THE ROMNEY MARSHES

The reclaimers began early, so early that we do not know who they were or when they lived. But we do know that the 24,000 acres of the true Romney Marsh were won before the end of the Roman occupation of Britain, for Roman remains have been discovered there. Further, from various evidences we can reconstruct the manner of working of these pioneers. They reinforced a shingle bank that ran far out into the sea and built an earthen wall some six miles long to connect with it, thus forming a great triangular peninsula of "made land" which the sea could not enter. This was the first and greatest of all the "innings" of the Romney Marshes whereby the tides were shut out of the levels and the new lands allowed to dry and consolidate until they could serve the farmer.

Triumph of Primitive Engineering The hopes or necessities which drove our ancestors to this achievement are now long forgotten, but they must have been great. There is plenty of information available on the modern Wash reclamations, and there are still men alive who can remember their fathers' tales of that appalling epic of the Burmese peasantry, the clearance of the Irrawaddy Delta. From such analogies and comparisons it is not difficult to imagine the cost in human effort, the physical anguish, and the ruthless, sustained purpose which made possible this triumph of primitive engineering. As achievements of the hand and will of ancient man, the miles of walling which inned the Romney Marsh surely surpass even Stonehenge or Maiden Castle. Much of this work stands to this day. The shingle bank has been incorporated into the modern Dymchurch wall, which is still the main defence of the Marshes against the sea. The earthen embankment, later called the Rhee Wall, is now far from the sea and carries a main road on its lowered crown. But it remains one of the major features of the Marsh landscape and an enduring monument to the unknown men who built it.

For over seven centuries the Rhee Wall continued as the farmer's frontier against the sea. During this period, nature added to the area of farmland; a Saxon charter of the eighth century, for instance, mentions a grazing marsh for a hundred and fifty beasts which accretion had created among the shingle banks that later became Dungeness. But man did little. Not until the twelfth century did he once more take the offensive. Then, however, advance was rapid. Indeed, the medieval innings were among the most remarkable incidents in the general campaign of reclamation which between Saxon and Victorian times created the countryside we know today.

Achievement of the Monks Work of this type was beyond the resources of the individual peasants who cleared so much of the primeval English woodland. Embankments on the scale required could only be planned and raised by a community. Here as elsewhere, therefore, the monks took the lead, and the first important innings beyond the Wall was made about 1160 by a most unexpected historical figure, Thomas à Becket. We think of him nowadays as a saint and a martyr. His own age knew him as one of the most brilliant and energetic officials in the realm, a friend as well as a servant of the king, a man sure to leave his mark on Church and State. He certainly left it on Romney Marsh where, as lord of the monastic estates, he planned and executed a major reclamation scheme. Today you can stand on the wall where he once stood with a cloak thrown over his finery, his maps in his hand and his bailiffs around him. Where he saw mud flats, you will see a green countryside which includes a square mile that is still called the Innings of St. Thomas.

After him came other great ecclesiastics who were also great reclaimers, and by the early fourteenth century most of the Rhee Wall was separated from the sea by a series of new innings. We know a good deal about this period, for by a fortunate chance the accounts of Henry of Eastry, who was Prior of Canterbury from 1285 to 1331, have been preserved. These records tell us much of the methods of construction, of the timber frameworks and the hurdles on which the clay was heaped, of the jetties and groins, of the facing of the walls with stone or tiles to break the force of the waves. They also make clear the burden of maintenance, for the walls needed constant repair and strengthening. Today, the old sea-walls wander aimlessly as embankments or causeways around the green fields they bound. But once they were the frontline defences in a major economic war.

Their story can be traced in the old accounts. In the year 1288, expenditure of £3 10*s.* for the inning of 28 acres; in 1301, receipt of £2, being the first rent received from the new land; in 1317, receipt of £3, being increased rent received from said land; between 1293 and 1305, total expenditure of £7 8*s.* 8*d.* for inning the land called *La Neulande* and for facing, strengthening and topping the embankment. So it goes on, year after year. In 1322, Henry noted in his papers that in the previous forty-five years he had spent in all £360 7*s.* on "inning land and securing it from the sea", a total investment in modern times of some £70,000.

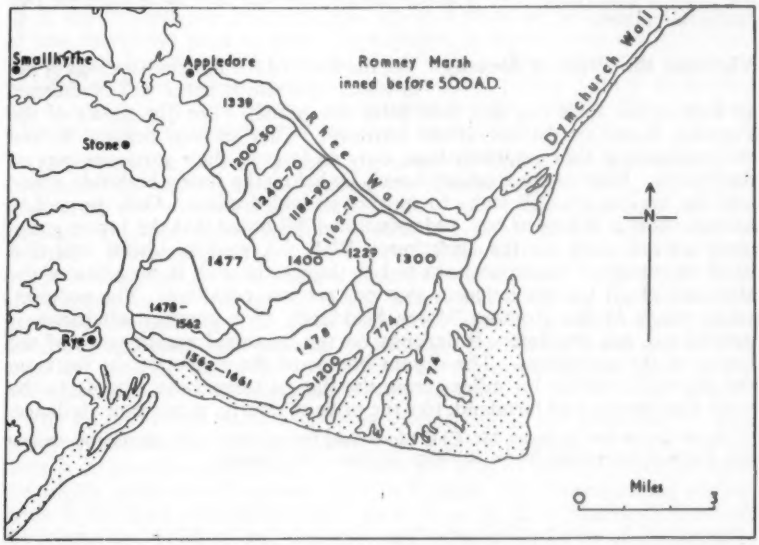
The codification in the thirteenth century of the ancient Custom of the Marsh and the appearance in the same period of local officials and royal commissioners to supervise the maintenance of sea defences and land drainage provided an interesting commentary on these developments. Only by disciplined communal effort could the waters be defeated and the new lands held.

The Sea Strikes Back But it was not all gain. The sea is no passive enemy, and the late thirteenth century was a period of flood and tempest. Old Winchelsea was half-ruined in 1250 "by a sea which flowed twice without ebbing", and was finally swept away by the great storm of 1287, when the village of Broomhill also perished. New Romney suffered severely and the Rother changed its course, emerging at Rye instead of New Romney.

The chronicles tell us much about these disasters. So do the accounts of Henry of Eastry, which show that the bailiff of Appledore between 1288 and 1293 spent twice his entire annual revenue on embanking. So, occasionally, does the land itself, though the story it tells needs skilled interpretation. Consider, for instance, a certain tangle of embankments and ponds that stand in a green field near the ancient site of Broomhill. To the casual visitor, it is incomprehensible: to those who have studied these matters, however, it is a lucid historical document. Here, they will explain, unknown men some time in the Middle Ages built a wall against the sea. It broke and a pond still bears witness to the scouring force of the waters which flooded into the newly-won land. Then it was repaired with a "horseshoe" reinforcement, similar in principle to those used by modern engineers. It broke again near the first breach (another pond marks the spot) and was repaired by a second horseshoe wall. The first horseshoe wall failed again, and this, too, was repaired by a third, smaller horseshoe. Finally, when this new defence broke, our ancestors abandoned the struggle. They removed much of the material from the useless wall to build another embankment a quarter of a mile back, and their innings returned to the sea from whence it came. The story of this defeat left no trace on the written

record. But the earthen archives still recall something of the pain and labour which went to the making of the Romney grazings.

After the Black Death, in the middle of the fourteenth century, reclamation flagged. It was farmers who were scarce, not farmland. But later, as population revived, men once more began to win land from the sea. About the year 1400, the monks undertook the general reclamation on the northern edge of the Marsh which continued throughout the century; two priors of this period spent £1,500 between them on this work. The days of the monks were numbered, but their spirit was still strong. Indeed, the sympathetic historian of Canterbury Priory remarks that the last age of this community saw two of the greatest achievements in all its long history. The first of these achievements was the building of the Bell Harry Tower, which is still the crowning glory of the cathedral. The second was the reclamation of the Appledore Marsh.



Historical map of the Romney innings from the earliest times to the seventeenth century. The dotted area represents shingle banks.

Coming of the Squires It was significant, however, that the last great innings of the Middle Ages was undertaken not by monks but by a layman. This was Sir Richard Guldeford, who in 1480 started to embank what is now the Guldeford Level, near Rye. You can still see there the church he built to serve the new parish he had created. It was consecrated by the Bishop of Chichester on September 20, 1505, which must have been a proud day for Sir Richard. He would have been prouder still if he could have known that he had founded a family tradition, for in the generations ahead his descendants were to complete the work of Becket and Henry of Eastry. The monks gave place to the squires, but the work to which they had put their hands continued.

Nevertheless, the heroic age of the innings was over. The work of the Guldefords, who in the next hundred and fifty years embanked the remainder

of the Walland Marsh, was but an epilogue to the achievement of the monks. In terms of physical change, for instance, the innings of Sir John Guldeford in 1542 caused the "utter decay" of the little harbour of Camber, just south of Rye. But the cumulative effect of the monastic innings over the centuries was the "utter decay" of Rye itself, which they gradually reduced from one of the proudest of the Cinque Ports to an inland town half an hour's walk from the sea. By 1618 we find the mayor of Rye complaining bitterly that "all trade hath now forsaken us", and Charles I authorizing a Sunday collection in every parish church for the relief of the stranded port. This defeat of the Portsmen by the Marshmen and the replacement of ships by sheep reflected the final victory of the reclaimers over the tides, though the formal end did not come until Victorian times. In 1838, the men of Rye completed the last of all the Romney innings—the enclosing of the 742 acres of saltings which lay beneath their walls. The site was symbolic, for much of it had once been Rye Harbour. But this was a mere historical curiosity, the belated confirmation of a defeat finally inflicted and accepted over two centuries earlier.

Vigilance the Price of Security Yet the story of the Romney innings is not finished. Indeed, it never will be finished so long as the tides run and men farm the Marsh. For the forces of the Farming Kingdom do not annex territory. They merely occupy it, and the government they establish lasts only so long as their garrisons stay at their posts. Most of the Romney Levels lie below the spring high-tide mark, and the tireless sea still seeks to recover its old domain. Only by steady human effort is it kept at bay. Marshall in 1798 noted that the repair gangs never ceased work on the Dymchurch Wall. A modern visitor will find their successors at the same tasks today, though the wall is now one of the strongest of all the sea defences that protect our coastline. The peculiar, silent peace of the Romney Marsh backlands on a summer afternoon is provisional, not absolute. It depends on the continual maintenance of the legacy of the reclaimers. The distant booms of the excavators at work on the sea-walls, visible for miles across the flat pastures, bear witness to the truth that the price of farmland, like the price of liberty, is constant vigilance.

The writer wishes to thank Mr. Cliff Bloomfield for so generously putting his unique and practical knowledge of the Romney innings at his disposal.

Some Articles of Outstanding Interest

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REALLOCATION OF FARMLAND IN THE NETHERLANDS

G. J. TER BRUGGE

Inspector in the Netherlands Government Service for Land and Water Use, Utrecht

Fragmentation is a problem affecting about half of the Netherlands' 5 million acres of farmland. With local co-operation, however, comprehensive schemes of reallocation are being prepared, and already over half a million acres have been, or are in the course of being, tackled.

JUST as in many other West European countries, a good deal of farmland in the Netherlands has been split up as a result of hereditary leasehold and increasing sales of land. In addition, in areas where the communal use of land has been abolished and the principle of equity (rather than that of efficiency) has been applied, we now find one person, who is sometimes the owner, occupying a number of scattered parcels of land. The aim is to eliminate this fragmentation of farmland by reallocation.

Our experience in the Netherlands, however, shows that the removal of fragmentation alone does not produce the desired improvement. As a rule, such areas are not opened up sufficiently. This means not only that the separate holdings are difficult of access, but also that the whole area is isolated. Furthermore, the water control is generally inadequate; for even in the Netherlands, where water is plentiful, the summer water supply is of great importance. The layout of the farms, still reflecting conditions that prevailed centuries ago, is often inefficient, and in general, main water, electricity and telephone services are lacking. Such deficiencies can be met only by carrying out a comprehensive development scheme, and in the Netherlands this is done by means of reallocation.

The nature of the work now being carried out is not dissimilar to that being undertaken in the under-developed eastern countries. Thus, just as there is an enormous difference in income per head of the population between the highly productive countries, such as England and America, and certain areas in the East and Middle East, so there is in the Netherlands between the fragmented holdings and the larger and more fertile farms of the country. A remarkable fact here is that, in spite of the considerable financial aid which has been given under reallocation, the difference in the levels of prosperity has widened appreciably since 1945. Consequently, it appears to be exceedingly difficult to keep pace with the development of these highly productive areas, to say nothing of making up arrears.

Modern Agricultural Revolution Kaldor, an English economist, has rightly said that such unprofitable areas should first go through an agricultural revolution. For this a complete change of mentality is required, so that farmers no longer produce only for themselves but also for the market, and so that the displaced farming population find other means of earning a living. This shifting—in other words, this agricultural revolution—occurs on a small scale in the Dutch reallocation.

There is, too, the difficulty of keeping down production costs. Because of the adverse conditions, costs in such backward areas are usually very high. This was recently demonstrated very clearly in the Netherlands when it came

to fixing the price of milk. The costs incurred on our small, fragmented holdings on the sandy soils in the east of the country proved to be much too high in comparison with those on the large, better parcelled-out holdings on areas of heavy clay soils. This is particularly true of the well-developed and drained Zuyderzee polders, where the advantages of good parcelling out are very evident.

One of the most acute problems is presented by undersized holdings that do not provide enough employment for two adult workers. It may be solved in either of two ways—by internal or external reform. Internal reform means that small holdings are enlarged by adding reclaimed land from the environs, and by purchasing any extra land available in reallocation areas. External reform means that land is made available elsewhere, as was done in the Zuyderzee polders.

Examples of external reform are to be seen in the reallocation of the Island of Walcheren after the war damage in 1944, and in the flooded areas in Zeeland after the disaster of February 1, 1953. For the former island, which has an area of approximately 17,000 hectares (42,000 acres), 2,000 hectares were made available in the north-east polder. For the flooded areas, which covered approximately 35,000 hectares (86,500 acres), 3,000 hectares will be made available. In both cases a special Act was passed. It hardly needs to be said that reform of this type is of very great importance for an area in which small holdings predominate. By this procedure, larger farmers who can meet certain requirements are given a chance of settling in the new Zuyderzee polders, while the land which they leave is bought by a foundation and allocated to the undersized farms. The success of the reforms in these two areas has been so marked that similar methods are now being adopted for ordinary reallocations. Since, however, the difficulties of fragmentation arise mainly on the sandy soils and the new polders consist of clay, large-scale experiments will be started next year on reallocation on sandy soils.

Long-term Schemes Application must be made by the farmers concerned before any action can be taken on reallocation. In some of the eleven provinces, priority has been based on the date of application; in others, lists were prepared on different lines. To attain greater uniformity and also to make reallocation fit in better with agricultural policy, a working party has been set up to prepare a comprehensive scheme for several years ahead. This working party will be composed of representatives of various ministries and services concerned with public housing, town and country planning, economy, soil fertility, statistics, etc. On the basis of various factors—such as the number of parcels per holding, the location of farm buildings, the size of holdings, the accessibility of parcels, the water position, utility works, the number of slums—a long-term scheme is now being drafted for every province.

From estimate and census it is clear that about one-half of the cultivated area of the Netherlands, or some 2½ million acres, is in need of reallocation. So far, some 200,000 acres have been dealt with, and 350,000 acres are in course of reallocation. Of recent years about 50,000 acres were completed annually, and it is the aim to increase this number to 75-100,000 acres a year. The carrying out of this intensive work, however, is fraught with many problems.

Reallocation entails the building and metalling of roads, the erection of pumping stations, the construction of water-conduits, the transfer of farms, and the provision of utility works, all of which costs a good deal of money

and requires detailed planning. Therefore, the Netherlands Ministry of Agriculture, Fisheries and Food has set up a special service for the planning and execution of the project. This is the Government Service for Land and Water Use (Cultuurtechnische Dienst), established at Utrecht.

The cost of reallocation at present averages about £100 per acre, towards which the farmer contributes £25 per acre. If so desired, he may pay this over a period of thirty years in annual instalments of 25*s*., at a rate of interest of 2.87 per cent.

The first Reallocation Act dates from 1924, but it was revised in 1938. The most recent Act, which makes possible the reallocation of leasehold land, was passed in 1954. Some of the principal points of this Act are the following. The general conduct is carried out by a Central Land and Water Use Committee which has been set up by the Minister of Agriculture, Fisheries and Food. The chairman of this committee is the Director-General of Agriculture, and its members represent the agricultural organizations and the Ministries of Water State, Housing, Home Affairs, Finance and Education, Arts and Sciences. The secretariat for the committee, and the preparation and execution of the schemes, are mainly entrusted to the Service for Land and Water Use.

When reallocation has been applied for, the appropriate provincial committee of this service prepares a provisional plan of roads and watercourses. This plan, together with the estimate of costs, is put to the local people. The plan is approved when more than half the landowners in the area concerned, or the owners of more than half of the area, are in favour of it. This involves that the dissentients submit to reallocation. A committee of local landowners, assisted by the provincial committee of the Service for Land and Water Use and a surveyor of the Land Registry, is then appointed. The surveyor is of great help to the local committee and is the central figure in the preparation of the final working plan. Without his assistance, the local committee would not be able to solve the numerous difficulties relating to land registry. The use of these local committees to carry out the most important reallocation works has made this type of land reform very popular in the Netherlands. Further, the law provides for a large measure of legal security.

Information about any aspect of reallocation that has not been fully dealt with in this brief survey will be gladly given on application to Cultuurtechnische Dienst, 21 Maliebaan, Utrecht, Holland.

ADVENTURES WITH CLOVER

G. E. FUSSELL, F.R.HIST.S.

It is not possible to say with any certainty when the clover ley was introduced into British farming, but the use of clover was being advocated by the agricultural writers of the day well before the end of the sixteenth century, and there are records of its inclusion in the farm rotation in the 1640s.

AMONG the muniments of Magdalen College, Oxford, is a document that describes a four-year clover ley grown on a Hampshire farm in 1686. The farmer who grew this crop must have been a daring man, and he must have had an enclosed field upon which to carry out what was probably an experiment. But he was not the first to venture upon the crop. Red Clover was by then fairly widely grown in north Hampshire, Wiltshire and Gloucestershire.(1)

Eighty years before, John Norden, who had some very sound ideas about the management of grassland, had advised farmers to look at the bare patches in the meadows in spring and to reseed them with "some hay seede, especially the seede of the Clauer-grasse, or the grasse honey-suckle and other seedes that fall out of the finest and purest hay; and in the sowing of it, mingle it with some good earth. But sow not the honey-suckle grasse in too moist a ground, for it liketh it not, therefore you must drain the place before you sow it."(2)

This was only advice. Norden nowhere mentions a farmer who was doing it. As much or as little can be said about Barnaby Googe, whose opinion in 1577, as reported by Ernle,(3) was that "the best herbe for pasture or meadow is the trefoil or clover". "Than this trefoil or Burgundian grass," he continued, "there can be no better fodder devised for cattell". But clearly Googe was not very certain of the identity of the plant. It was that "which the people of old time call Treefoile, the Frenchmen call Grandtrefle and the Spaniards call Alfalfa".(4) In spite of his continental travels, Googe had not learned to distinguish between Nonsuch clover, sainfoin and lucerne, though his suggestion for its use was in accordance with the continental system of using a clover ley—that is, to sow the first year, feed off with sheep the second, and graze with cattle in the third.

Many other Englishmen serving with Elizabeth's armies in the Low Countries, as well as businessmen, botanists and scholars, must have seen the Flemish method of growing clover and using it for cattle fodder before Sir Richard Weston recorded it in 1644. Gerarde had written in 1597 that "there is a Meadow trefoil that is sowen in fieldes of the Low Countries, in Italie and divers other places beyond the seas, that cometh up ranker and higher than that which groweth in meadows and is an excellent food for cattel both to fatten them and cause them to given great store of milke". Curiously enough, however, Weston's is the earliest known description of clover cultivation in Belgium. Previous development there is only hazily guessed at, and although a great deal is often made of the mention of indigenous clover in the pastures recorded by Dodeons in 1550, this was spontaneous, or perhaps due to the grazing animal. They were certainly not cultivated leys.(5)

Continental Influence The rotation which Weston saw in Flanders and preached in England was flax—turnips—oats, with clover bush-harrowed in and grazed from after oat harvest till Christmas, mown three times the following year, and then left down as a ley for four or

five years until exhausted. He tried out the system on his own land at Worplesdon, Surrey. Other people were soon interested, but there is some suspicion that the idea was not new to Britain.[6] Gerarde had indeed recorded the presence of wild varieties of sainfoin and tares as well as clover in this country, and is credited with having known that most of them "were used here as horse fodder crops".[7] It is evident, too, that an import trade in clover seed was well established by 1653 when the third edition of Walter Blith's *English Improver Improved* appeared. "There are so many sorts of Claver", he wrote, "as would fill a volume, I shall onely speake of the great Claver or Trefoyl we fetch from Flanders, called by Clusius, *Trefollium majus tertium*, which bares the great red Honysuckle, whose leaf and branches far exceeds our naturall Meadow Claver . . ."

Clover seed had in fact been imported to Norfolk from Holland as early as 1620, but by the end of the century a return trade had developed, and it is recorded that 9 cwt. of clover seed were exported to Holland in 1697, though it is not clear from which port it was sent.[8] Soon after Weston's little book appeared (and Hartlib pirated it as his *Legacy*), seed of the "Great Clover of Flanders" was advertised for sale "at the shop of James Long at the Barge in Billingsgate".[9]

One of the greatest difficulties confronting the farmer who wanted to grow a clover ley was the poor quality of the "Dutch" seed. Everybody thought it essential to use imported seed, not only in the mid-seventeenth century, but for long after. Unfortunately, there was no guarantee with the seed. Blith used some and it failed to germinate. In his opinion, it was either because the Dutch did not want us to learn the proper use of the crop and so over-dried the seed and destroyed its life, or because the London shopkeepers had been obliged to carry over stock from one year to the next. In order not to lose money, they mixed the old seed with the new and so made the lot virtually valueless. Blith advised sending an experienced man to the Low Countries to examine stocks of seed there and buy a good sample. When a first crop had been raised from imported seed, then, he maintained, its seed was the best for future use, "if you can ripen it kindly, get it dry and preserve it". The method of getting it out of the husk was so far a mystery to the English farmer. The best he could do was to thresh it out of the straw, and polt or faulter it (that is, beat it out again in the husk and remove as much of the refuse as possible by separating it with a narrow-toothed rake). It was then dried in hot sun and the seed rubbed out.

Undersown in Cereals It was the practice at that time to sow clover seed in a barley or oat nurse crop and bush-harrow it in: it was necessary to sow when there was little or no wind, because the seed was hand broadcast. Clover could also be sown, so we are informed, on any land intended for grazing, on any bare places in a meadow, or on highways trodden or "pocked". The latter refers, I imagine, to green verges. But the recommended way was under a nurse crop, at the end of March or beginning of April. All the writers agreed that clover would fatten cattle quickly and increase milk yield. Blith estimated that it might keep two cows an acre—a conservative figure for his times.[10]

Despite all the difficulties, Andrew Yarranton of Ashley, Worcester, declared that soon after Weston's book was published there was some clover sown in most of the counties of England, and the established trade in imported seed, referred to by Blith, confirmed this. Yarranton himself brought clover seed to Ross in Hereford,[11] and popularized its growing in Worcestershire and the adjoining counties between 1653 and 1677. Sir John

Winford, a former High Sheriff, had no less than 60 acres under the crop as a result of Yarranton's propaganda, and Mr. Thomas Hill, a grazier who frequented the fairs of Worcester, Stafford and Shropshire, also cultivated it. Unfortunately, Yarranton does not supply the names of other farmers in this area who grew clover, but he admits that some were not successful with it.[12]

Yarranton agreed with the accepted practice of sowing clover under a nurse crop of barley. The first crop, he suggested, might be grazed when the barley was off, but the cattle should only be allowed in the clover for a short time every day to avoid blowing them. The second season's crop could be mown in June and again in August and a heavy yield might be expected from each cutting. In his opinion, 6 acres of clover were equal to 30 acres of natural grass—perhaps not an over-optimistic claim when we consider the amount of wild grass in his day. He recommended the use of lime to stimulate the growth of clover in meadows, and his method of making clover hay was, in fact, used for very many years.

On the other side of the country, Nicholas Toke, a landowner in Kent, bought clover seed in 1653, and from that year his accounts show that he was amongst the adventurous ones who grew clover as a usual crop on his land.[13] On some land near Ashford both red and white clover were cultivated at about this time. Kent had always been a county of highly diversified farming, and must have been in constant touch with the Continent. Perhaps that was why the farmers were not opposed to new ideas and were quick to adopt the cultivation of clover.

Introduction of Clover-Ryegrass Mixtures About the end of the seventeenth century Edward Lisle, who lived at Crux Easton, Hampshire, near where the three counties of Berkshire, Hampshire and Wiltshire abut upon one another, noted that clover and ryegrass had been grown on the downs in the neighbourhood for at least fifty years, although he himself preferred ryegrass alone to a mixture with clover. Lisle often mentions the farmer who was doing something special. Clover, vetches and ryegrass were fairly widely grown about 1700 in the Isle of Wight, where Lisle had some property, but the tenants here favoured ryegrass to clover. But he was hard put to account for success or failure in growing broad red clover. For example, Farmer Iles of Holt got a good crop on cold springy clay in 1716, while Farmer Lavington grew it equally well on black, sandy mellow land.

Webb, of Mountain Farley, got seeds of wild white clover from Sussex and found that "it holds the ground and decays not".[14] A systematic practice had been worked out in Sussex, and the old wheat and bean course abandoned in favour of a rotation of two corn crops, followed by clover and ryegrass for a 3-year ley. The seeds were sown under either barley or oats, but occasionally under wheat. English seed was considered best, and a mixture of 10-12 lb. clover and 8 lb. ryegrass was sown. The first crop of clover hay was cut in May and the plant was then left until after it had seeded, when cattle were turned in to graze. The clover land was heavily marled or limed, and it is obvious that this treatment had been used on grassland in the county for at least a century before 1707, although the use of clover and ryegrass together may not have been so old.[15] Mortimer also states that some Essex farmers sowed a pound or two of clover per acre as a catch crop and fed it off in the spring before they fallowed their land. He did not say how long-established this practice was.

Oxfordshire farmers, too, improved heavy clay in 1676 by sowing it with peas or vetches, or by laying it down to ryegrass, usually accompanied by

Nonsuch or Melilot trefoil. Indeed, they cropped the land repeatedly until it was fit only for ryegrass and trefoil.[16] According to Lennard, clover seed was being sold soon after the Restoration as far west as Exeter, and the crop was sown for ley under oats when land went back to grass after several years of cropping.[17]

Clover Critics There were plenty of farmers in seventeenth-century England who were willing to grow a new crop. They may have been owner-occupiers or gentlemen-farmers then, but it is difficult to believe Tull's complaint that farmers advised to grow clover would reply that it was a gentleman's fancy and would not pay rent. A good many farmers not far from Prosperous Farm were already growing it, and had long done so. Nor is it easy to accept Richard Bradley's complaint that it was a long time before clover emerged "from the fields of gentlemen to common use". It may indeed, as Ernle says, not have penetrated into Suffolk villages as a crop till the eighteenth century,[3] but the Elizabethan herbalist, Turner, records that he saw *Melilot arvensis* in Suffolk meadows (although it was probably indigenous).[18]

One writer at the end of the seventeenth century expressed the fear that new grasses and grass mixtures were gaining ground so rapidly, especially in Herefordshire, Worcestershire and some parts of Gloucestershire, that they ought to be prohibited by Parliament. Otherwise, he argued, the rent of natural meadows would be unfairly depressed (it had already fallen at least 15 per cent).[19] The argument may have been economically correct, but it was politically quite impossible. Nevertheless, it certainly points to the widespread establishment of the clover crop, with or without a mixture of other grass seeds, by 1700. Many farmers had been growing the crop for at least fifty years then, and may have been doing so for far longer.

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FARMING AFFAIRS

New Cage Traps for Grey Squirrels Two new wire-netting cage traps for grey squirrels recently tested by the Forestry Commission may well prove to be the answer to the squirrel menace especially in areas where shooting and ordinary spring trapping are undesirable. Both were originally designed by Mr. J. W. Legg, a warrener at Queen Elizabeth Forest in Hampshire, and are available commercially.

The first of these traps is permanently baited and set, so that about six squirrels may be caught between visits by the trapper. Essentially, the trap consists of an entrance tunnel, 4 inches square, which is fitted with two light metal swing doors hung from the roof and opening in one direction only. This tunnel leads to a compartment for retaining the captured squirrels. Below the tunnel is set a detachable bait tray which lures the squirrels through the trap doors. The front of the trap and the sides of the entrance tunnel are covered with solid metal plating, so that the sight of a trapped squirred does not deter others from entering.

The second—a single-catch type—is quite different in design and action. The squirrel enters through a hole at the front of the trap, in its quest for the bait that is scattered around this entrance and on the trap floor. Most of the bait, however, is spread at the back, and whilst trying to get at this the squirrel is almost sure to disturb a wire grille, which by a simple mechanism allows the sliding door to fall over the entrance hole under its own weight. The trip grille itself is not baited.

For the best results, trap sites should be chosen carefully where grey squirrels are most often seen. Where possible, a large tree, with boughs extending well down the trunk, should be selected. Undergrowth and vegetation should be scanty. Traps can be camouflaged effectively with short branches of green leaves or dead vegetation placed around and on the corners, taking care not to foul the entrance.

Pre-baiting both inside and outside traps for a few days before trapping starts is most important. Plenty of bait should be broadcast in a wide circle around the trap, with rather more near the entrance. A good supply of bait must also be placed inside the trap and entrance tunnel. If the bait is taken, this pre-baiting should be continued for at least five days.

All traps should be visited at least once a day, particularly if the single-catch type is used. With the permanent-baited trap it has been found that the best method of handling captured squirrels is by means of a wire-netting cone, approximately 15 inches long and 4½ inches diameter at the open end. This is placed over the exit door and held firmly in position. As soon as the squirrel enters the cone, the open end of the wire netting is pressed down flat so that the squirrel cannot back out. In the case of the single-catch type of trap, a bag or sack may be used instead of the wire cone. Once in the cone or sack, the squirrel can be killed promptly and humanely.

The Mechanic on the Farm: 18. Metal Corrosion Rust-preventing fluids are probably more useful for farm equipment than for any other machinery, since many seasonal implements tend to rust away before they wear out. Even when these anti-corrosion preparations are used, careful cleaning is often necessary, although some cleaning is done automatically by the action of the soil on plough boards, hoes and other soil-working tools. This land polish is always worth preserving. When polished components are rusted, only hard work and use can

restore the smooth scouring surface; and if they become really badly pitted it may be impossible to restore them. Grease or old oil should therefore be smeared on the vulnerable surfaces after each day's work. At the end of the operating season, the bright parts should be treated with a rust-preventing fluid and kept out of contact with floors of earth or concrete.

Of all farm implements, fertilizer distributors are probably the most prone to corrosion. When work is finished for the day, the machine should be run until it is as empty as the distributing mechanism can make it. Then all the residue must be cleared out. With some machines this job can be helped by turning the hopper body upside down on the axle.

Even when it is known that the distributor is going to be needed again the next morning, it should still be thoroughly cleaned, because during the night the temperature of the air is near its dew point and any little parcels of fertilizer left behind will begin to set into hard lumps. If it can be managed easily, the distributor should be brought back into a building overnight, but if the machine must be left in the field it should be covered with a waterproof sheet, or with plenty of sacks or empty fertilizer bags which have been well shaken out to make sure that they do not spread manure on parts of the machine which have been brushed.

When the distributor is not likely to be used again for some months, it should be given a really meticulous cleaning to get rid of fertilizer, and it must also be treated in some way to protect it against the ordinary rusting hazards that months of idleness bring to any bright steel or iron parts. The whole of the distributing mechanism must be dismantled and a separate job made of cleaning every single component with a wire brush. Then the inside of the hopper should be washed and scrubbed in hot water containing washing soda at the rate of ½ lb. to every gallon. The metal components should be rinsed and dried and then coated with a rust-preventing compound. If a rust preventive used is of the type which will set hard, the protective coating will have to be removed before the distributor is put back into service, so it is better to leave the detachable parts unassembled.

An alternative to the use of rust-preventing compound for small components, such as chain links or star wheels, is to place them in a cut-down oil drum and to cover them with used oil from tractor or car sump. This not only keeps them in good condition but also guards against their getting separated and mislaid. The used sump oil may contain a trace of water and acid and some minute quantities of air, but no appreciable corrosion will be caused by these impurities, provided the metal parts are kept completely submerged.

When paint on the steel parts of any farm machine persists in flaking off and leaving rusty patches, the metal should be treated with a phosphating compound before it is repainted.

H. J. Hine

Farm and Forest: 7. Treating Old Woodlands (1) When considering the treatment, or rehabilitation, of an old woodland the first important thing is to consider the fertility of the soil, for certain kinds of trees demand rather special conditions. The major distinction is that if the woodland soil is comparable to that of agricultural land, then broadleaved species such as oak or beech should thrive; if the soil is poorer it would be advisable to plant conifers. Again, one can say that on the drier and better drained fertile soils beech should be suitable; and on the moister, heavier, and richer land, oak should succeed. Similarly on the poorer sites; if they are fairly dry, one of the pines, or perhaps Western Hemlock should do well, while the spruces are suited to moister sites. Douglas fir will thrive

on well-drained loams in sheltered spots, and larch, while demanding a fairly good soil, will withstand some degree of exposure. Generally speaking, conifers grow faster and begin to yield usable or unsaleable poles a good deal sooner than hardwood trees. So for economic reasons it is becoming a common practice, even on very fertile soils, to mix a proportion of softwoods with the broadleaved species, and to use the conifers to provide the early and smaller produce while leaving the hardwoods to develop into the more valuable later thinnings and the final crop.

However, some of these species, such as oak, larch and most pines need to be planted either in the open or in fairly large clearings, where there is plenty of light. Other species (for instance, beech and Western Hemlock) will tolerate (and sometimes benefit from) a certain amound of shade, at least for the first ten years or so, yet will still develop vigorously. This demand for full daylight or tolerance of half shade has to be taken into account when deciding what to do with existing woodland.

It is worth mentioning that there is an increasing number of private forestry advisers who will contract to do all the necessary initial work of clearing and replanting, and also the weeding and tending which is essential for the first few years until the new woodland crop is safely established. On the other hand, a very good first step for anyone who has even a small area of unproductive woodland which he wishes to set to rights would be to get in touch with the local Conservator of Forests, whose address can be obtained from the Agricultural Executive Committee, the telephone book, or G.P.O.; a District Forest Officer will then be available to give free advice both about forestry operations entailed, any regulations involved, and the cash grants which may be paid.

The two types of grant most likely to be payable for this type of work are: (1) the Scrub clearance grant (where the cost of clearance is between £15-25 per acre a grant of £7 10*s.* per acre is given, while if clearance costs more than £25 per acre there is a grant of £12 10*s.* per acre), and (2) a planting grant of £15 per acre. Both are subject to certain conditions. These grants, together with the Income Tax reliefs which can be claimed in respect of money spent on forestry operations, help to make the treatment of old woodlands a very attractive proposition.

A. D. MILLAR,
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Forestry Commission

Carnation Sedge and Sheep The carnation sedge, or carnation grass (*Carex panicea* Linn.), is widely distributed throughout Britain, particularly in meadows and moist pastures, and may frequently be found at high altitudes. According to Bentham and Hooker,* the plant is perennial, with stems tufted but sending out creeping runners from the base, and 12-18 inches high. It has rather short, erect, flat leaves, more or less glaucous. The flower-head carries three spikelets, of which the terminal one is male and the others female.

When free of the competition of other plants, carnation sedge does not grow so tall as when it is in competition with other hill species; associated with heather, it may reach 18 inches or more. Since the plant is evergreen, it is important as a winter food for sheep, which graze it in preference to other plants, but because of its normal low growth habit a light covering of snow is sufficient to make it inaccessible. Much less attention is paid to it in the summer months, however, when other species are available. The value

* G. BENTHAM and J. D. HOOKER. *Handbook of the British Flora*, 1924.

of the plant is probably greatest on heather moors in the first and second seasons after burning, since it is the first species to colonize the moor in the interval before heather again produces sufficient keep.

Samples taken at random from a small selected area of the moor near Teignhead, Devon, at about monthly intervals during the summer, and at two-monthly intervals in autumn and winter, have been analysed for their feeding value. The results obtained are:

	Percentage of Dry Matter						
	Jan. 9	Apr. 3	May 23	June 20	July 11	Sept. 18	Nov. 2
Crude protein	9.71	11.40	12.61	11.84	11.38	10.80	10.56
Ether extract	2.04	1.63	2.15	2.76	2.59	2.17	2.26
N-free extractives ...	55.29	58.93	59.30	56.71	55.15	56.55	56.11
Crude fibre	28.27	23.23	18.73	23.77	26.34	25.34	26.93
Ash	4.688	4.814	7.206	4.920	4.535	5.140	4.138

Further analysis of the crude protein (C.P.) gave the following:

	Jan. 9	Apr. 3	May 23	June 20	July 11	Sept. 18	Nov. 2
True protein (T.P.) as percentage of dry matter	9.56	9.30	11.02	11.52	10.68	10.54	9.21
Percentage digestibility of C.P.	34.50	47.19	39.44	35.85	37.36	35.37	40.15
T.P.:C.P.	0.98	0.82	0.87	0.97	0.94	0.98	0.87

Analysis of the ash, again expressed as a percentage of the dry matter, yielded the following results:

	Jan. 9	Apr. 3	May 23	June 20	July 11	Sept. 18	Nov. 2
Lime (CaO)	0.220	0.189	0.157	0.163	0.162	0.174	0.247
Phosphoric (P_2O_5) ...	0.263	0.285	0.319	0.309	0.307	0.269	0.271
Silica (SiO_2)	1.454	1.384	2.420	1.419	1.538	2.041	0.948

These figures indicate that in May the crude protein content of carnation sedge compares not unfavourably with that of the recognized fodder species (for example, perennial ryegrass), which, when under extensive management, are rapidly approaching the " hay stage " by this time. During early summer and autumn there is less crude protein present, the minimum being found in January. Digestibility of the crude protein is greatest in April and November, at which times the true/crude protein ratio is widest.

With the exception of the samples taken in April, May, and June, the amount of crude fibre tends to be rather high and, between April and July, is inversely related to the crude protein. Dry matter is not unduly low, except in April; in the summer months it is markedly higher than in perennial ryegrass, cocksfoot and certain other fodder species.

Carnation sedge does not appear to be high in mineral constituents. It contains little lime, and what there is declines as the season advances. The amount of phosphoric acid present increases to a maximum in May, and throughout the season follows the same trend as the crude protein. Though at no time high, it may supply useful amounts to the ration during early summer.

Carnation sedge is thus not outstanding in respect of any major food constituent, nor is it remarkable amongst other indigenous moorland species. Nevertheless, by producing an " early bite " it can make a substantial contribution to the diet and total ration of hill sheep, particularly on heather moors after burning.

B. M. Dougall,
Seale-Hayne Agricultural College

IN BRIEF

Light and Life

Darkness-daylight hours have a very considerable influence on the animal, and recent research has shown that many of the seasonal changes which take place in animals are due to these hours of daylight rather than to temperature changes . . . For example, the ferret and the mink have a long heavy winter coat and a short light summer one. If, however, at the onset of winter they are given a short-dark and long-light day, by placing electric light in front of their cages after dark, they undergo a moult and go into a summer coat although kept at a low winter temperature . . .

These same darkness-daylight ratios are also the cause of the breeding seasons which occur in most animals originating near the Poles. The ferret, for example, breeds in England only during the summer months, from about March to September when the days are long. It can be made to breed in England, however, during the winter by making the hours of light longer than those of darkness. The mechanism of this is that the long light-short dark ratio stimulates nerves in the region of the eye and this is conveyed to the brain, where it increases the output of the secretions of the anterior pituitary gland into the blood stream and these hormones stimulate the ovaries to activity. This also holds for the horse, a summer breeding animal, in which added light after dark during winter speeds up both the shedding of the winter coat and the onset of the breeding season. In the fowl too, where the natural peak of egg production occurs with lengthening days in the spring, the provision of electric light after dark in the autumn months increases the output of eggs at a time of year when they are naturally scarce.

Dr. John Hammond, Biology and Human Affairs

Sheep on Dairy Pastures

The August issue of *The Milk Producer* contains a warning on the adverse effects in certain circumstances of wintering sheep on dairy pastures. The result, says one of the Milk Marketing Board's Consulting Officers, is that in his particular area all the fields so utilized were completely bared down by the spring. " Some of the farmers concerned endeavoured to get an early bite by using ' Nitro-Chalk ', but the boost from the nitrogen was eaten off by the sheep, and also in some cases by the milking cows, as soon as the grass started to grow. This constant nibbling at pastures endeavouring to throw up leaves weakens individual plants and has a subsequent depressing effect on pasture yields. Although the prospect of some ready cash at the end of the winter is hard to resist, milk producers who wish to have an early bite next spring and who want their pastures to yield a large amount of good feed during the next grass growing season should seriously consider whether wintering of sheep on their dairy pastures is really worth while."

World Food Supply

The latest report from the United Nations Food and Agriculture Organization shows that the world's food production is overtaking the increase in its population. Excluding the Communist countries, for which figures are inadequate, agricultural output was more than 25 per cent greater in 1954 than it was in 1946-47. At the end of the war, says the report, 5 per cent less food was being produced, while population had risen 10 per cent. But 1954 production has overtaken the deficit.

Trickle Irrigation

The present conception of trickle irrigation evolved from a need for a watering system which, using very little labour, would apply sufficient water to each plant without the surface soil effects usually encountered with hose watering. In its present form, trickle irrigation is suitable for use where plants are grown to a definite pattern of spacing, as is normal with glasshouse crops. An installation consists of a permanent layout of water supply pipes, usually using one pipe per row of plants, with each plant receiving water from a nozzle fed from and mounted on the pipe.

With such a system where the water for each plant is applied at one point only, compared with the wide coverage of a multiple orifice rose, the rate of water application must be extremely slow if local flooding is not to take place. The modern trickle nozzle has an output of about a quarter of a gallon per hour when supplied with water at 4 foot head—which is equivalent to 1.7 lb. per sq. inch.

As trickle nozzles require a water supply at about 1.7 lb. per sq. inch and water mains pressure can vary from 10 to 100 lb. per sq. inch, depending on the district and day of the week, some method of pressure reduction is required. One way is to throttle back the ordinary standpipe valve until the reduced pressure head, as indicated by a glass manometer tube, reaches the desired value. When a small number of nozzles are being used, this arrangement gives a very coarse adjustment. There is available commercially a specially modified standpipe valve, which utilizes a needle control for the first few turns, and this gives a much finer adjustment, without limiting the valve's output when fully open.

Hypomagnesaemia and Ruminal Ammonia

In a letter to *Nature* (August 6, 1955) Dr. M. J. Head and Mr. J. A. F. Rook, of the Chemistry Department of the National Institute for Research in Dairying at Reading, suggest that hypomagnesaemia of dairy cows on grass, particularly during the early spring, may arise from an inadequate absorption of magnesium, probably associated with high production of ammonia in the rumen.

They accept the assumption that the daily intake of magnesium by the grazing cow receiving no other food or supplements is comparable with that during the stall-feeding period, but recent work at Reading has shown that the excretion of magnesium in the urine is markedly and rapidly reduced with the change to spring grass. This points to the possibility of some alimentary disturbance during early grazing which modifies the availability or absorption of magnesium. At the same time there is an appreciable rise in the ammonia content of the rumen liquor—some three or four times the general level. The mechanism of the change in magnesium utilization is not yet understood, but it is feasible, the writers suggest, that ammonia may pass in quantity from the rumen to the small intestine, where an interaction could take place.

Enter the "Lacombe"

A new breed of pigs, the "Lacombe", has been developed by the Canadian Department of Agriculture's Experimental Station at Lacombe, Alta. This breed is the result of seven years' careful selection and mating of a combination of Landrace, Chester White and Berkshire, with Landrace pre-

dominating. The Lacombe, when crossed with the Yorkshire, at the Lacombe and Scott Experimental Stations produced crossbred pigs equal or superior to either breed in all important economic traits, such as rate of gain and quality of product.



U.S. Cattle to Improve South American Herds

"United States breeders of cattle for warm climates are selling more and more of their product in Latin American countries. Last year 15,000 head valued at more than $8 million moved to far-flung points south of the border —a considerably larger export than in the year before and the largest since 1946.

"Colombia, Venezuela, and several other Latin American countries obviously are on the threshold of a new era of livestock raising. These nations want to diversify their agriculture. Too often they have seen the distress that accompanies a fall in the price or a failure of an important crop—coffee or cacao, for instance—and they wish to spare their economies from the effects of one-crop farming.

"They also want to improve the living standards of their people. As South America has become more industrialized, its beef surplus has tended to decline. Its population is increasing rapidly, and in many parts of the continent the standard of living is rising fast; both circumstances make strong incentives for increasing livestock production. South America's long-time role as an important supplier of beef for deficit areas of the world seems to be on the wane: Argentina and Uruguay are now the only surplus-beef producers of any importance; and many countries such as Colombia, Peru, Paraguay, and Brazil, which formerly were large exporters of beef, are finding it difficult to produce enough to fill the expanding needs of their own people. In fact, in a few years the beef importers of the world may not be able to buy beef in Latin America and may have to look to Africa as a new source."

Foreign Agriculture



High Brick-built Grain Storage Bins

The Ministry has learned of a number of cases where high brick-built grain storage bins have failed and partially collapsed.

Until more is known of the causes of these failures, it is suggested that farmers who are storing grain in bins of this type should, as a safety measure, reduce the amount of grain in them so that the standing height in each bin does not exceed 12 feet.

During this operation there may be additional strain on the structure because of increased pressures in the grain while it is moving.

To avoid risk of injury from falling masonry, farm staff should be warned not to stand too close to the bins during emptying. This warning should be given whether or not cracks have appeared in the masonry.



Workshop Hint

A dilute solution of milk of magnesia brushed on the threads of bolts before running on the nuts will keep them turnable. For corroded nuts and bolts, try putting on common tincture of iodine, which has remarkable penetrating power.

BOOK REVIEWS

Maintenance of Horticultural Equipment. P. A. REYNOLDS. Allen and Unwin. 16*s.*

Mechanization has perhaps come later to the horticulturist than to the agriculturist, but there is now a very wide range of implements to serve growers of almost all fruit, vegetable and ornamental crops. Wisely chosen, these machines can do more than almost anything to reduce the toil and therefore the cost of production, and whatever his interest, the modern horticulturist must attune his methods to the efficient use of mechanical assistance.

The author of this book first offers the grower advice on how to choose suitable machinery for cultivating, and then supplies many useful hints on what is necessary to keep such machinery working efficiently and how to carry out running repairs. The chapter on choosing a machine shows a sensible approach, ending with the suggestion that the final decision should be made after seeing a demonstration on the grower's holding. It is a pity, however, that there is no reference here to the valuable published reports of tests made by the National Institute of Agricultural Engineering on many of these machines.

A large part of the book is devoted to the workshop and workshop equipment and to an explanation of various forms of internal combustion engines. Many growers, the successors of those whose spades and forks were cleaned and oiled each night, already carry out much of the routine maintenance suggested in these chapters, but even they might gain from a careful perusal of this very practical advice. For the young man who is hoping to have his own holding later on, or who works on a small place without a specialist maintenance mechanic, this section should prove invaluable, for it will give him something of the same useful attitude to machines as he will already have gained towards potting composts, pruning, or ventilating a glasshouse.

Other chapters deal briefly with electricity, water boilers, brick and concrete work, and woodworking, and all give useful hints to the unskilled in such trades.

More space might perhaps have been given to sprayers and dusters, and mention might usefully have been made of the use of irrigation equipment and ploughs, while it would not have widened the scope of the book unduly to have dealt with the day-to-day operation of heating boilers. But the basis of the subject is there, and for the grower who has no objection to dirt in the form of manure or soil and yet still shows a natural antipathy to oil and paraffin, this book could do much to fill the gap in his knowledge.

F.W.S.

All about Pigs: 800 Questions Answered. Pig Publications. 7*s.* 6*d.*

The " question and answer " feature in the agricultural press is always popular and much useful information is put over in this way. But few papers can find space to print all the answers, and few readers take the trouble to keep a scrap-book for reference. The publishers of this book are therefore to be congratulated on solving both these problems by gathering together many of the current questions and their answers to provide, at a very reasonable price, a veritable encyclopaedia on the pig.

The contents are arranged in sections under the broad headings of breeding, feeding, housing, management and veterinary problems, and there can be few questions that the pig-keeper is likely to ask which are not dealt with. Thus feeding covers such points as water supply, silage, waste food of many kinds, grazing and the use of antibiotics. In the well-illustrated housing section, examples of successful cconversions of various buildings are given, and there are many useful line drawings of equipment which can be made on the farm. Management includes points as diverse as methods of catching sows, the use of the electric fence, the merits of lucerne versus grass for grazing, and how to obtain an income of £15-20 a week from pigs. The veterinary section is also full of information.

If I may be permitted a general observation, it is that comparatively few questions seem to be asked on breeding problems. Sixteen pages suffice to cover the whole field, whereas ninety are required to deal with feeding problems. Can it be that pig-keepers know all the answers?

All pigmen will find useful ideas and sound advice on every aspect of their particular branch of farming in this handy, paper-backed book.

J.W.R.

BOOK REVIEWS

Milk from Leys in the Weald of Sussex. Imperial Chemical Industries.

This extremely well-written booklet is a case study of a small dairy farm, setting out very clearly and with a wealth of easily followed charts and tables its improving fortunes between 1949 and 1953. The broad picture shown is one—familiar enough now under Wealden circumstances—of a change-over from a policy of mixed farming with a proportion of land devoted to cash crops, to an economy based upon better grassland with the improved dairy herd as its outlet.

The details of the study are concerned with the total food costs as measured against gross income, and are finally expressed in charts which show that, although the total cost of foodstuffs from all sources has tended to rise over the period, the "gross margin" available to meet all other farm expenses and to provide the profit has risen to a very much greater extent, whether expressed per cow or per gallon of milk produced.

The study is a good one in that it sets out clearly the fertilizer practice, grazing control and grass conservation methods that have contributed to the steady annual improvement in the size of the gross margin. Especially revealing is the disclosure of the hard cash saved by enforcing the discipline that cows will tie up for milking during the grazing season without the so-called "handful" of purchased concentrates.

But perhaps the most important virtue of the booklet lies in its illustrations of the viewpoints that must be taken and the yardsticks of efficiency that must be followed in propounding the changes of methods in the first instance, and then in evaluating their subsequent effects.

Copies of the booklet may be obtained free from Imperial Chemical Industries, Bolton House, 61 Curzon Street, London, W.1.

E.A.B.

The Chemists' Veterinary Handbook (11th Edition). Chemist and Druggist. 27*s.* 6*d.*

The greater part of this book deals with diseases of horses, cattle, sheep, goats, pigs, rabbits, dogs, cats and bees. A section is devoted to each species, descriptions are brief but clear, and methods of control are reasonably up to date. The remainder includes chapters dealing with vaccine and serum therapy, antibiotics, vitamins, hormones and glandular preparations, but these occupy less space than is devoted to prescriptions for numerous stock medicines and to a "selection of established remedies", some of which appear to be of questionable value.

An obvious danger in a book of this nature is that it may tempt the small chemist to try his hand at treatment. The admonition "In no circumstances . . . should advice be given on treatment" is not very conspicuously placed amongst "hints on animal nursing". It might have been given more prominence, and extracts from the Veterinary Surgeons Act, 1948, would have been helpful in bringing out the point. In any case, one would hardly have expected diseases of the eye, lameness in horses, anaesthesia and dentition of the horse to find a place in a book which is intended primarily as a guide to the pharmacist.

The book, which is a revised version of *Veterinary Counter Practice*, is of a handy size and is well produced.

J.C.D.

Show them the Land (16 mm. Film Guide and Catalogue). Compiled by C. A. PRATT. Cable Printing and Publishing Co. 7*s.* 6*d.*

The publishers are to be congratulated on producing this excellent catalogue, which gives detailed information on the scope and availability of over a thousand 16 mm. films. Although the films listed are classified as "agricultural", the term has been used in its widest sense to include a comprehensive selection of films on a number of industries allied to farming.

School-teachers, organizers of Y.F.C. functions, secretaries of discussion groups, and indeed everyone associated with agricultural educational activities, will find a wealth of up-to-date information presented for their guidance in this catalogue. Each film, complete with synopsis, is listed in alphabetical order. In addition, all films are classified under "subject" and in a geographical index (embracing no less than 26 countries), thus offering boundless possibilities for the selection of titles and programme building.

About half the films listed are available to borrowers free, and charges for the others do not exceed a maximum of 7*s.* 6*d.* for the first day's hire.

W.J.S.F.

BOOK REVIEWS

Soil Fertility. C. E. MILLAR. Chapman and Hall. 54*s*.

Professor Millar, until recently head of the Department of Soil Science, Michigan State College, states in his preface that this book was written for students taking a course in soil fertility and as a work of reference for students in soil management courses. It is satisfactory from both points of view. Professor Millar deals thoroughly with the physical and chemical requirements of the soil for plant growth and the effects of micro-organisms, manures and fertilizers on crop production. He also quotes freely from the results of field experiments.

The author is writing primarily for American students and naturally deals in the main with conditions as they occur in the U.S.A. For this reason, some of the chapters, and particularly that on crop rotations, are of little value to British readers. Even for American readers, however, one would have thought that more reference would have been made to work carried out in other parts of the world; for, with the exception of some of the early European researches and the classical Rothamsted experiments, little mention is made of outside experiences. The list of references, too, is almost exclusively American.

Despite this, the book is likely to be useful in Britain, since it presents the results of a good deal of American work which are not generally available over here. The account of the long-term experiments, started in various parts of the U.S.A. from 1876 onwards, is also very valuable.

The illustrations fall below the general standard of production of the book, and, in particular, those depicting nutrient deficiencies could be greatly improved. The general layout is excellent and the book is adequately indexed.

J.W.

Estate Incomes. University of Cambridge, Department of Estate Management. 2*s*.

This booklet is the third of a series issued by Cambridge University dealing with the taxation of agricultural estates and the problem of estate duty. Together with its two predecessors, it forms a valuable contribution to knowledge of a subject on which precise information has hitherto been sadly lacking.

The material for the studies has been obtained from a research survey undertaken by the university, and an obvious, though doubtless unavoidable, weakness is the limitation in the size of the sample (37 estates covering 341,596 acres in the present study). On the information available, however, the survey clearly demonstrates the inability of agricultural estates to form capital from estate revenue. It goes on to suggest full tax relief on maintenance expenditure on an annual basis, together with a moderate increase in the Statutory Repairs Allowance, as essential steps towards a healthier land ownership economy.

Copies of the booklet may be obtained from the Department of Estate Management, 74 Trumpington Street, Cambridge.

C.M.G.

Grading of Honey. (British Standard 1920:1955). British Standards Institution. 1*s*.

In response to requests made by the British Beekeepers' Association, an Advisory Committee on Honey Marketing Standards was set up by the Ministry of Agriculture and Fisheries in 1951 to undertake a revision of the standard grades for honey. The recommendations of that Committee as to national grades and definitions for clear and crystallized honey have now been adopted by the British Standards Institution.

The definitions include those for purity, flavour, cleanliness, colour and consistency. A testing and certification scheme will be administered by the Federation of Bee and Honey Associations. In addition to defining these grades, the Standard also sets out the general requirements for extracted heather honey, which is not at present included in the certification scheme.

The grades for "select crystallized" and "extra select heather" honey were revised earlier and published in the 1952 edition of this Standard, copies of which may be obtained from the Institution at 2 Park Street, London, W.1.

E.N.

Details of national grades and grade definitions for home-produced honey are also given in the Ministry's *Marketing Guide* No. 43, which is obtainable free from the Ministry of Agriculture, Fisheries and Food (Publications), St. Andrew's Place, London, N.W.1.

East Malling Research Station Annual Report, 1954. 12*s.* 6*d.*

Included in this report are a general review of fruit research at the station, some twenty or more research reports, and three bulletins for fruit-growers. The bulletins, which interpret the results of research in general terms, deal with the search for better fungicides, the Fruit Tree Capsid bug, and apple orchard practice in Canada.

The reference in the bulletin on Canadian orchard practice to modifications in spraying routines, aimed at reducing the harmful effect of sprays on beneficial insects which prey on fruit pests, finds a parallel development in comparable changes in our own spraying practice, which are discussed elsewhere in the report in an interesting account of the effect of insecticides on the balance of animal populations.

The widespread circulation throughout the world of many of the Malling apple rootstocks gives special importance to a fully illustrated review which describes the complete series for the first time. Many of these rootstocks have been investigated for over forty years.

Research reports of general interest include those on the propagation of rootstocks from cuttings of apple, cherry and pear, and on variety trials and pruning trials with black currants. Descriptions of lesser-known fruit diseases include Leaf Roll of cherry and Nettlehead of hops. Accounts are also given of transient yellows and streak of strawberries, and of work on the control of Apple Sawfly.

Soil compaction studies at East Malling have indicated that the slight rise in minimum air temperature close to the ground brought about by the use of the roller may save low-growing crops, such as strawberries (and, to a less extent, gooseberries and currants) from frosts of marginal severity.

A.J.L.L.

Britain. An Official Handbook, 1955. H.M. Stationery Office. 10*s.*

In just over 400 pages, the basic data on the economy, administration and social structure of modern Britain are presented in clear, concise form. But that is not all. To the citizen whose knowledge of Britain is based on the tenuous profile sketched by school geography and the press, the book provides opportunity to see the country full face, and even to delve into history, following the track of historic freedoms as they broaden from precedent to precedent. From agriculture to zebra crossings, from almoners to holidays with pay, from wages to the Wallace collection, the book sets out in readable style much factual information unobtainable elsewhere in such handy form. It is a pity that much of the statistical data does not go beyond 1953 or the first half of 1954, but the obvious care for accuracy evident throughout the book merits high praise for the Reference Division of the Central Office of Information and the Central Statistical Office. The illustrations are pleasing and informative.

Britain, 1955 should be in all our libraries, private as well as public, home and overseas, and take its place among indispensable books of reference used by all whose job it is to tell the world about Britain.

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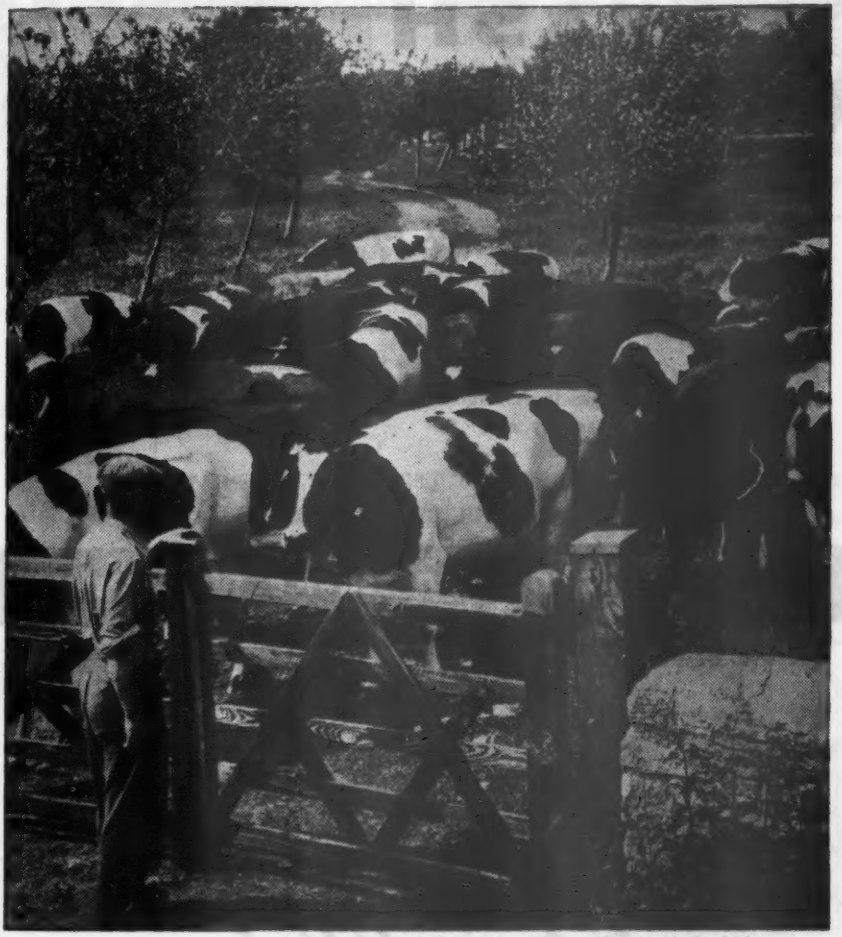
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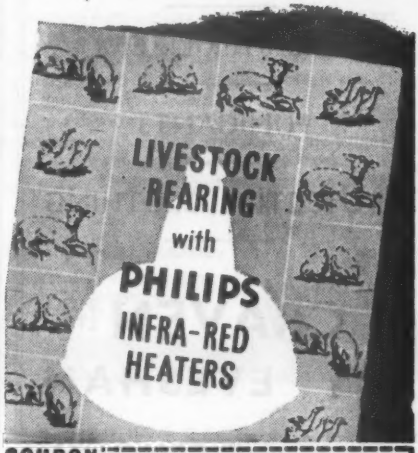
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